FOR YOUR SAFETY
If you smell gas:

1. **Open windows.**
2. **DO NOT try to light any appliance.**
3. **DO NOT use electrical switches.**
4. **DO NOT use any telephone in your building.**
5. **Extinguish any open flame.**
6. **Leave the building.**
7. **Immediately call your local gas supplier after leaving the building. Follow the gas supplier's instructions.**
8. **If you cannot reach your gas supplier, call the Fire Department.**

⚠ WARNING

Fire Hazard

Do not store or use gasoline or other flammable vapors and liquids in the vicinity of this or any other appliance.

Some objects can catch fire or explode when placed close to heater.

Failure to follow these instructions can result in death, injury or property damage.

BANANZA

BANANZA® BH

The Economical Unitary Infrared Heater

Installation, Operation & Service Manual

BH-40
BH-60
BH-80
BH-100
BH-115
BH-125
BH-140
BH-150
BH-175
BH-200

⚠ WARNING

Improper installation, adjustment, alteration, service or maintenance can result in death, injury or property damage. Read the Installation, Operation and Service Manual thoroughly before installing or servicing this equipment.

Installation must be done by a contractor qualified in the installation and service of gas-fired heating equipment or your gas supplier.

Installer

Please take the time to read and understand these instructions prior to any installation. Installer must give a copy of this manual to the owner.

Owner

Keep this manual in a safe place in order to provide your serviceman with necessary information.

Bananza
1100 Seven Mile Road NW
Comstock Park, MI 49321
Telephone: 616.698.0500
Fax: 616.726.8800
Toll Free: 800.255.3416

www.bananza.com

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SECTION 1: HEATER SAFETY

Your Safety is Important to Us!
This symbol is used throughout the manual to notify you of possible fire, electrical or burn hazards. Please pay special attention when reading and following the warnings in these sections.

Installation, service and annual inspection of heater must be done by a contractor qualified in the installation and service of gas-fired heating equipment.

Read this manual carefully before installation, operation or service of this equipment.

This heater is designed for heating nonresidential indoor spaces. Do not install in residential spaces. These instructions, the layout drawing, local codes and ordinances, and applicable standards that apply to gas piping, electrical wiring, venting, etc. must be thoroughly understood before proceeding with the installation. Protective gear is to be worn during installation, operation and service. Thin sheet metal parts, such as the reflector portion of the heater and the various venting components, have sharp edges. To prevent injury, the use of work gloves is recommended. The use of gloves will also prevent the transfer of body oils from the hands to the surface of the reflector.

Before installation, check that local distribution conditions, nature of gas and pressure, and adjustment of the appliance are compatible.

For additional copies of the Installation, Operation and Service Manual, please contact Bananza.

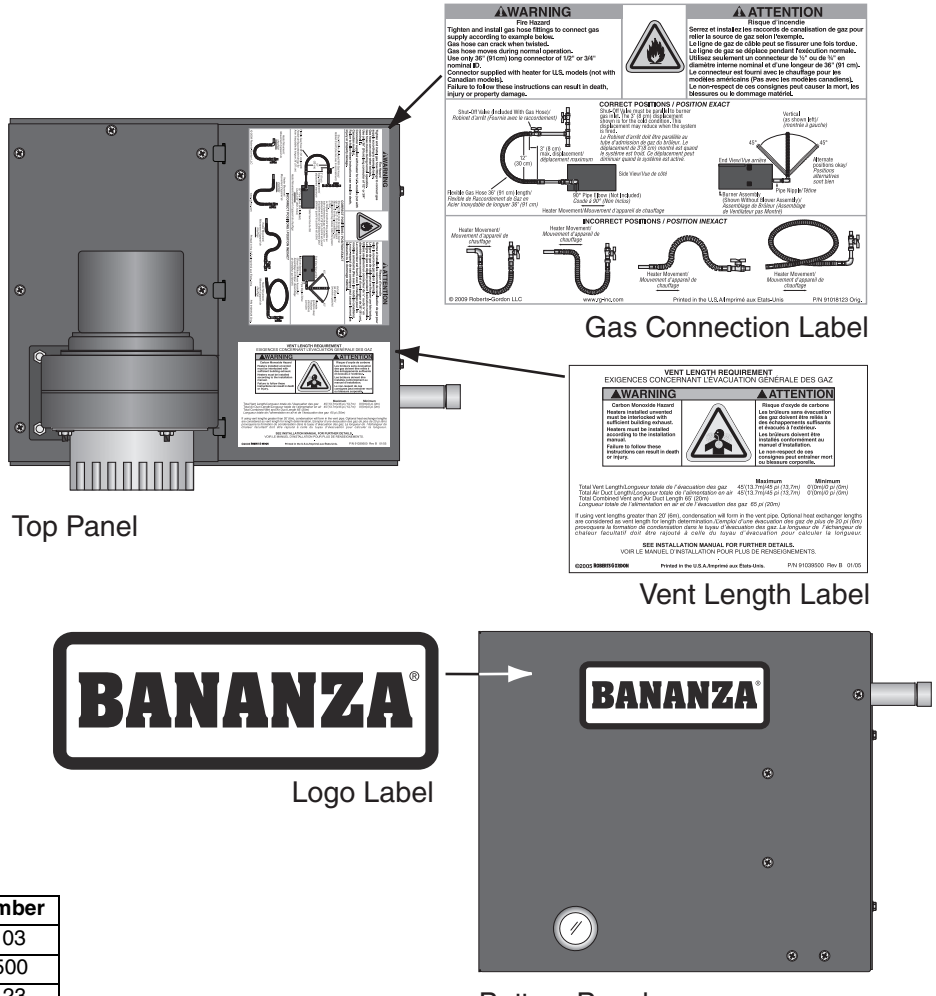
1.1 Manpower Requirements

To prevent personal injury and damage to the heater, two persons will be required for installation.

1.2 Safety Labels and Their Placement

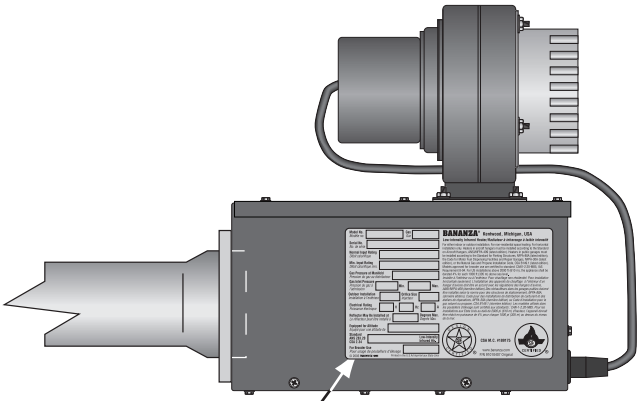
Product safety signs or labels should be replaced by the product user when they are no longer legible. Please contact Bananza or your BANANZA® independent distributor to obtain replacement signs or labels. *See Page 1, Figure 1through Page 2, Figure 2*.

FIGURE 1: Top and Bottom Panel Label Placement

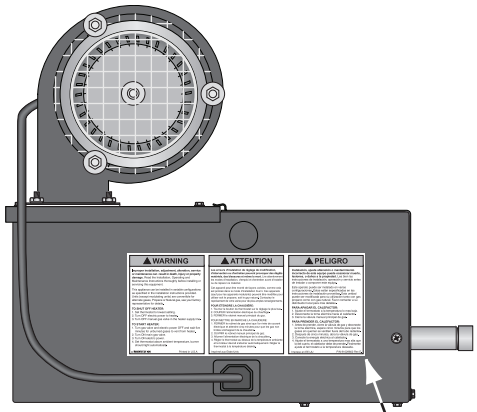


Description	Part Number
Logo Label	91031103
Vent Length Label	91039500
Gas Connection Label	91018123

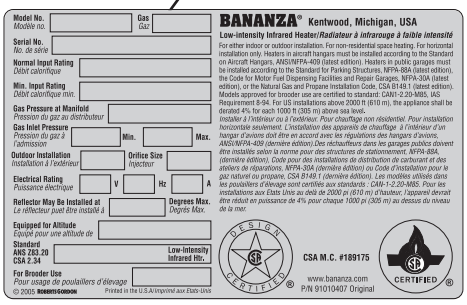
FIGURE 2: Side and Back Panel Label Placement



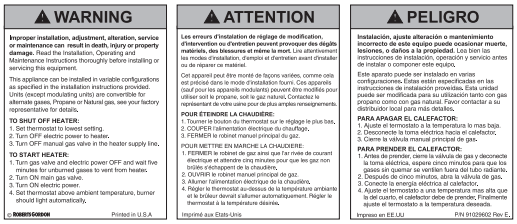
Side Panel



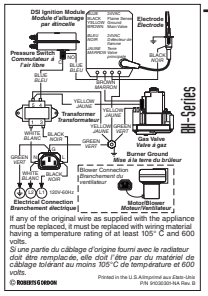
Back Panel


BANANZA® Kentwood, Michigan, USA
Low-Intensity Infrared Heater/Radiateur à infrarouge à faible intensité
CSA M.C. #189175
CERTIFIED

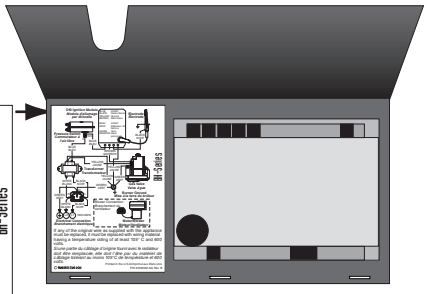
Rating Plate Label



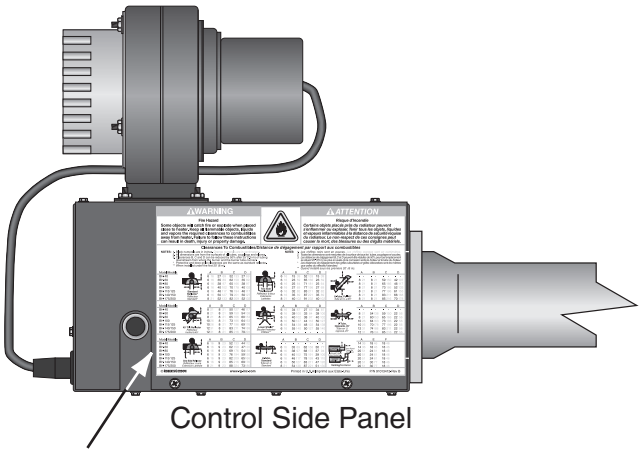
Lighting Instruction Plate Label



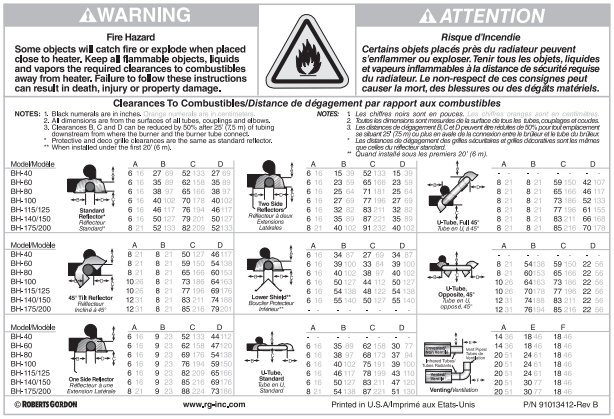
Wiring Label



Control Door (Inside)



Control Side Panel


WARNING
Fire Hazard
Some objects will catch fire or explode when placed close to heater. Keep all flammable objects, liquids and vapors the required clearances to combustibles away from heater. Failure to follow these instructions can result in death, injury or property damage.
ATTENTION
Risque d'incendie
Certains objets placés près du radiateur peuvent s'enflammer ou exploser. Tenir tous les objets, liquides et vapeurs inflammables à la distance de sécurité requise du radiateur. Le non-respect de ces consignes peut causer la mort, des blessures ou des dégâts matériels.
Clearances To Combustibles/Distance de dégagement par rapport aux combustibles

Clearances to Combustibles Label

Description	Part Number
Rating Plate Label	91010407
Lighting Instruction Plate Label	91029602
Wiring Label	91030301
Clearances to Combustibles Label	91013412
Thermostat Connection Label (not shown)	91037902

SECTION 2: INSTALLER RESPONSIBILITY

The installer is responsible for the following:

- To install the heater, as well as the gas and electrical supplies, in accordance with applicable specifications and codes. Bananza recommends the installer contact a local Building Inspector or Fire Marshal for guidance.
- To use the information given in a layout drawing and in the manual together with the cited codes and regulations to perform the installation.
- To install the heater in accordance with the clearances to combustibles.
- To furnish all needed materials not furnished as standard equipment.
- To plan location of supports.
- To provide access on all sides for burner servicing and removal.
- To provide the owner with a copy of this Installation, Operation and Service Manual.
- To never use heater as a support for a ladder or other access equipment and never hang or suspend anything from heater.
- To ensure there is adequate air circulation around the heater and to supply air for combustion, ventilation and distribution in accordance with local codes.
- To safely and adequately install heater using materials with a minimal working load of 75 lbs (33 kg).
- To ensure the heater is placed in an approved application.

2.1 Wall Tag

A laminated wall tag is available for the heater as a permanent reminder of the safety instructions and the importance of the required clearances to combustibles. Please contact Bananza or your BANANZA® independent distributor to obtain the wall tag. Affix the tag by peeling
off the backing of the adhesive strips on the rear surface and position the tag on a wall near the heater (e.g. thermostat or BANANZA® Controller). A copy of the wall tag (P/N 91037921) is illustrated on the back cover. For an immediate solution, you may affix this copy on the wall near the heater.
Know your model number and installed configuration. Model number and installed configuration are found on the burner and in the Installation, Operation and Service Manual. *See Page 5, Figure 3 through Page 8, Figure 12*. Write the proper clearance dimensions in permanent ink according to your model number and configuration in the open spaces on the tag.

2.2 Corrosive Chemicals

⚠ CAUTION

Product Damage Hazard

Do not use heater in area containing corrosive chemicals.

Refer to appropriate Material Safety Data Sheets (MSDS).

Failure to follow these instructions can result in product damage.

Bananza cannot be responsible for ensuring that all appropriate safety measures are undertaken prior to installation; this is entirely the responsibility of the installer. It is essential that the contractor, the sub-contractor, or the owner identifies the presence of combustible materials, corrosive chemicals or halogenated hydrocarbons* anywhere in the premises.

**** Halogenated Hydrocarbons** are a family of chemical compounds characterized by the presence of halogen elements (fluorine, chlorine, bromine, etc.). These compounds are frequently used in refrigerants, cleaning agents, solvents, etc. If these compounds enter the air supply of the burner, the life span of the heater components will be greatly reduced. An outside air supply must be provided to the burners whenever the presence of these compounds is suspected. Warranty will be invalid if the heater is exposed to halogenated hydrocarbons.*

2.3 National Standards and Applicable Codes

All appliances must be installed in accordance with the latest revision of the applicable standards and national codes. This refers also to the electric, gas and venting installation. Note: Additional standards for installations in public garages, aircraft hangars, etc. may be applicable.

SECTION 3: CLEARANCES TO COMBUSTIBLES

3.1 Required Clearances to Combustibles

Clearances are the required distances that combustible objects must be away from the heater to prevent serious fire hazards. Combustibles are materials that may catch on fire and include common items such as wood, paper, rubber, fabric, etc.

Maintain clearances to combustibles at all times for safety.

Clearances for all heater models are located on the burner of the heater and *on Page 5, Figure 3 through Page 8, Figure 12* in this manual. Check the clearances on each burner for the model heater being installed to make sure the product is suitable for your application and the clearances are maintained. Read and follow the safety guidelines below:

- Keep gasoline or other combustible materials including flammable objects, liquids, dust or vapors away from this heater or any other appliance.
- The stated clearances to combustibles represents a surface temperature of 90° F (32° C) above room temperature. Building materials with a low heat tolerance (such as plastics, vinyl siding, canvas, tri-ply, etc) may be subject to degradation at lower temperatures. It is the installer's responsibility to assure that adjacent materials are protected from degradation.
- Maintain clearances from heat sensitive equipment and workstations.
- Maintain clearances from vehicles parked below the heater.
- Maintain clearances from swinging and overhead doors, overhead cranes, vehicle lifts, partitions, storage racks, hoists, building construction, etc.
- In locations used for the storage of combustible materials, signs must be posted to specify the maximum permissible stacking height to maintain required clearances from the heater to the combustibles. Signs must be posted adjacent to the heater thermostat. In the absence of a thermostat, signs must be posted in a conspicuous location.
- Consult local Fire Marshal, Fire Insurance Carrier or other authorities for approval of proposed installation when there is a possibility of exposure to combustible airborne materials or vapors.
- Hang heater in accordance to the minimum suspension requirements *on Page 14, Figure 14*.

⚠ WARNING

Fire Hazard

Keep all flammable objects, liquids and vapors the minimum required clearances to combustibles away from heater.

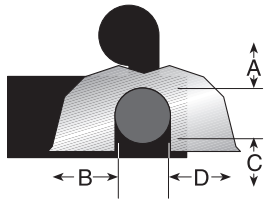
Some objects will catch fire or explode when placed close to heater.

Failure to follow these instructions can result in death, injury or property damage.

- If the radiant tubes must pass through the building structure, be sure that adequate sleeving and fire stop is installed to prevent scorching and/or fire hazard.

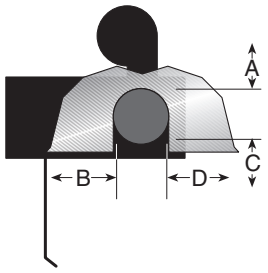
NOTE: 1. All dimensions are from the surfaces of all tubes, couplings and elbows.
2. Clearances B, C and D can be reduced by 50% after 25' (7.5 m) of tubing downstream from where the burner and burner tube connect.

FIGURE 3: Standard Reflector



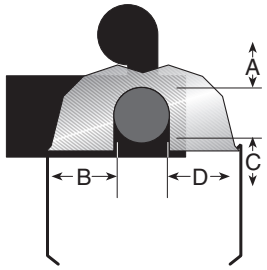
Model	(inches) A	B	C	D	(centimeters) A	B	C	D
BH-40	6	27	52	27	16	69	133	69
BH-60	6	35	62	35	16	89	158	89
BH-80	6	38	65	38	16	97	166	97
BH-100	6	40	70	40	16	102	178	102
BH-115/125	6	46	76	46	16	117	194	117
BH-140/150	6	50	79	50	16	127	201	127
BH-175/200	8	52	82	52	21	133	209	133

FIGURE 4: One Side Reflector



Model	(inches) A	B	C	D	(centimeters) A	B	C	D
BH-40	6	9	52	44	16	23	133	112
BH-60	6	9	62	47	16	23	158	120
BH-80	6	9	69	54	16	23	176	138
BH-100	6	9	76	59	16	23	194	150
BH-115/125	6	9	82	65	16	23	209	166
BH-140/150	6	9	85	69	16	23	216	176
BH-175/200	8	9	88	73	21	23	224	186

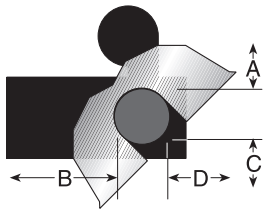
FIGURE 5: Two Side Reflectors



Model	(inches) A	B	C	D	(centimeters) A	B	C	D
BH-40	6	15	52	15	16	39	133	39
BH-60	6	23	65	23	16	59	166	59
BH-80	6	25	71	25	16	64	181	64
BH-100	6	27	77	27	16	69	196	69
BH-115/125	6	32	83	32	16	82	211	82
BH-140/150	6	35	87	35	16	89	221	89
BH-175/200	8	40	91	40	21	102	232	102

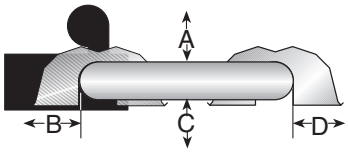
NOTE: 1. All dimensions are from the surfaces of all tubes, couplings and elbows.
2. Clearances B, C and D can be reduced by 50% after 25' (7.5 m) of tubing downstream from where the burner and burner tube connect.

FIGURE 6: 45° Tilt Reflector



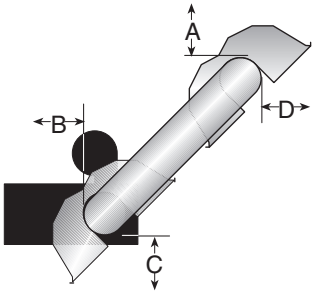
Model	(inches) A	B	C	D	(centimeters) A	B	C	D
BH-40	8	8	50	46	21	21	127	117
BH-60	8	8	59	54	21	21	150	138
BH-80	8	8	65	60	21	21	166	153
BH-100	10	8	73	64	26	21	186	163
BH-115/125	10	8	77	69	26	21	196	176
BH-140/150	12	8	83	74	31	21	211	188
BH-175/200	12	8	85	79	31	21	216	201

FIGURE 7: U-Tube, Standard Reflector



Model	(inches) A	B	C	D	(centimeters) A	B	C	D
BH-40	- UNAPPROVED -				- UNAPPROVED -			
BH-60	6	35	62	30	16	89	158	77
BH-80	6	38	68	37	16	97	173	94
BH-100	6	40	75	39	16	102	191	100
BH-115/125	6	46	78	43	16	117	199	110
BH-140/150	6	50	83	47	16	127	211	120
BH-175/200	8	54	87	51	21	138	221	130

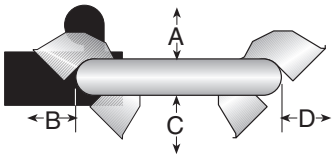
FIGURE 8: U-Tube, 45°



Model	(inches) A	B	C	D	(centimeters) A	B	C	D
BH-40	- UNAPPROVED -				- UNAPPROVED -			
BH-60	8	8	59	42	21	21	150	107
BH-80	8	8	65	46	21	21	166	117
BH-100	8	8	73	52	21	21	186	133
BH-115/125	8	8	77	61	21	21	196	155
BH-140/150	8	8	83	66	21	21	211	168
BH-175/200	8	8	85	70	21	21	216	178

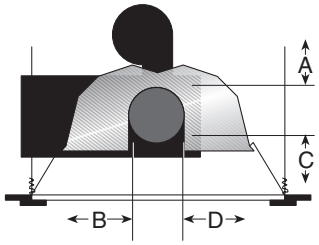
NOTE: 1. All dimensions are from the surfaces of all tubes, couplings and elbows.
2. Clearances B, C and D can be reduced by 50% after 25' (7.5 m) of tubing downstream from where the burner and burner tube connect.

FIGURE 9: U-Tube, Opposite 45° Reflector



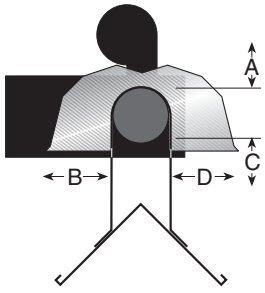
Model	(inches) A	B	C	D	(centimeters) A	B	C	D
BH-40	- UNAPPROVED -				- UNAPPROVED -			
BH-60	8	54	59	22	21	138	150	56
BH-80	8	60	65	22	21	153	166	56
BH-100	10	64	73	22	26	163	186	56
BH-115/125	10	70	77	22	26	178	196	56
BH-140/150	12	74	83	22	31	188	211	56
BH-175/200	12	76	85	22	31	194	216	56

FIGURE 10: 2-Foot Deco Grille and Protective Grille



Model	(inches) A	B	C	D	(centimeters) A	B	C	D
BH-40	6	27	52	27	16	69	133	69
BH-60	6	35	62	35	16	89	158	89
BH-80	6	38	65	38	16	97	166	97
BH-100	6	40	70	40	16	102	178	102
BH-115/125	6	46	76	46	16	117	194	117
BH-140/150	6	50	79	50	16	127	201	127
BH-175/200	8	52	82	52	21	133	209	133

FIGURE 11: Lower Clearance Shield*

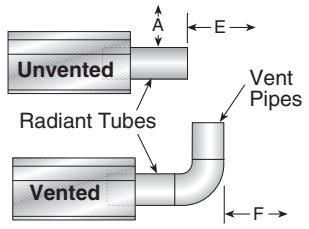


Model	(inches) A	B	C	D	(centimeters) A	B	C	D
BH-40	6	34	27	34	16	87	69	87
BH-60	6	39	33	39	16	100	84	100
BH-80	6	40	38	40	16	102	97	102
BH-100	6	50	44	50	16	127	112	127
BH-115/125	6	54	48	54	16	138	122	138
BH-140/150	6	55	50	55	16	140	127	140
BH-175/200	- UNAPPROVED -				- UNAPPROVED -			

*When installed in the first 10' (3 m).

NOTE: 1. All dimensions are from the surfaces of all tubes, couplings and elbows.
2. Clearances B, C and D can be reduced by 50% after 25' (7.5 m) of tubing downstream from where the burner and burner tube connect.

FIGURE 12: Venting



Model	(inches)			(centimeters)		
	A	E	F	A	E	F
BH-40	14	18	18	36	46	46
BH-60	14	18	18	36	46	46
BH-80	20	24	18	51	61	46
BH-100	20	24	18	51	61	46
BH-115/125	20	24	18	51	61	46
BH-140/150	20	30	18	51	77	46
BH-175/200	20	30	18	51	77	46

SECTION 4: NATIONAL STANDARDS AND APPLICABLE CODES

4.1 Gas Codes

The type of gas appearing on the nameplate must be the type of gas used. Installation must comply with national and local codes and requirements of the local gas company.

United States: Refer to National Fuel Gas Code NFPA 54/ANSI Z223.1 - latest revision.

Canada: Refer to Natural Gas and Propane Installation Code CSA B149.1 - latest revision.

4.2 Aircraft Hangars

Installation in aircraft hangars must be in accordance with the following codes:

United States: Refer to Standard for Aircraft Hangars, NFPA 409 - latest revision.

Canada: Refer to Natural Gas and Propane Installation Code CSA B149.1 - latest revision.

In aircraft storage and servicing areas, heaters shall be installed at least 10' (3 m) above the upper surface of wings or of engine enclosures of the highest aircraft which may be housed in the hangar. The measurement shall be made from the wing or engine enclosure (whichever is higher from the floor) to the bottom of the heater.

• In shops, offices and other sections of aircraft hangars communicating with aircraft storage or servicing areas, heaters shall be installed not less than 8' (2.4 m) above the floor.

• Suspended or elevated heaters shall be so located in all spaces of aircraft hangars that they shall not be subject to injury by aircraft, cranes, movable scaffolding or other objects. Provisions shall be made to assure accessibility to suspended heaters for recurrent maintenance purposes.

4.3 Public Garages

Installation in garages must be in accordance with the following codes:

United States: Refer to Standard for Parking Structures NFPA 88A - latest revision or the Code for Motor Fuel Dispensing Facilities and Repair Garages, NFPA 30A - latest revision.
Canada: Refer to Natural Gas and Propane Installation Code CSA B149.1 - latest revision.

• Heaters must not be installed less than 8' (2.4 m) above the floor. Minimum clearances to combustibles must be maintained from vehicles parked below the heater.

• When installed over hoists, minimum clearances to combustibles must be maintained from the upper most point of objects on the hoist.

4.4 Electrical

The heater must be electrically grounded in accordance with the following codes:

United States: Refer to National Electrical Code®, NFPA 70 - latest revision. Wiring must conform to the most current National Electrical Code®, local ordinances and any special diagrams furnished.

Canada: Refer to Canadian Electrical Code, CSA C22.1 Part 1 - latest revision.

4.5 Venting

The venting must be installed in accordance with the requirements within this manual and the following codes:

United States: Refer to National Fuel Gas Code NFPA 54/ANSI Z223.1 - latest revision.

Canada: Refer to Natural Gas and Propane Installation Code CSA B149.1 - latest revision.

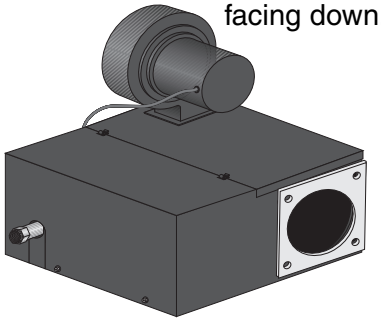
4.6 High Altitude

These heaters are approved for installations up to 2000' (610 m)(US), 4500' (1370 m)(Canada) without modification. Consult factory if US installation is above 2000' (610 m) or Canadian installation is above 4500' (1370 m).

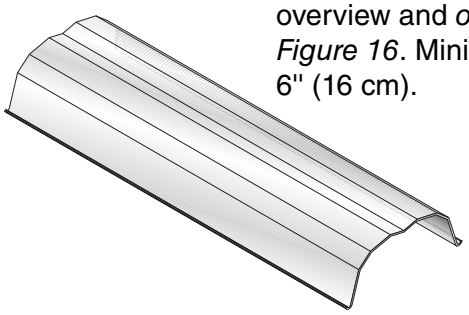
SECTION 5: MAJOR COMPONENTS

FIGURE 13: Major Component Descriptions

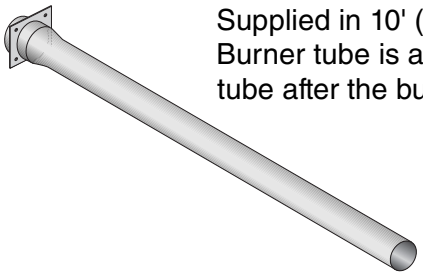
Burner with Tube Gasket
Must be installed with the flame observation window facing down.



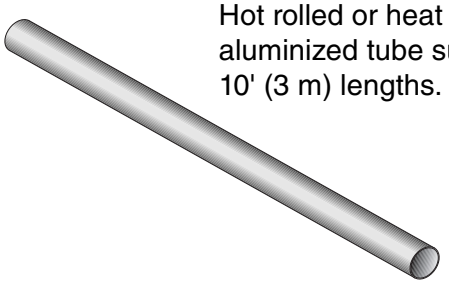
Reflector (Aluminum or Stainless Steel)
Alternate overlap as shown on overview and *on Page 16, Figure 16*. Minimum overlap is 6" (16 cm).

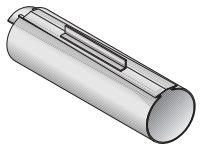


Burner Tube
Supplied in 10' (3 m) lengths. Burner tube is always the first tube after the burner.

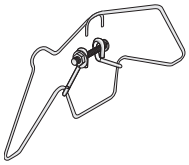


Tube
Hot rolled or heat treated aluminized tube supplied in 10' (3 m) lengths.

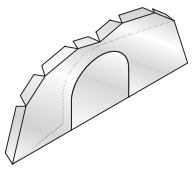




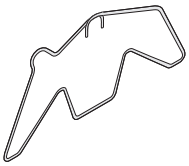
Coupling Assembly with Lock



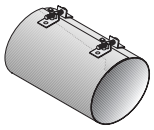
Tube and Reflector Hanger with Clamp Package
Position this hanger no more than 4” (10 cm) away from the burner.



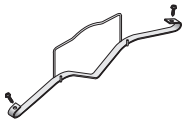
Reflector End Cap
Punch out center section to accommodate tube.



Tube and Reflector Hanger
Suspend system from these hangers.

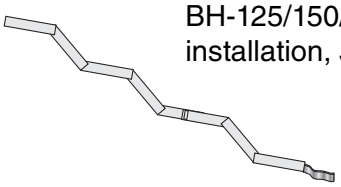


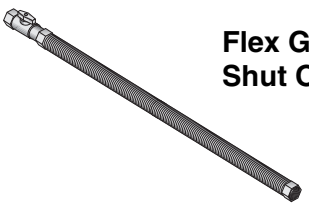
Vent Adapter



Reflector Support Strap & Wire Form

Turbulator
Turbulator must be installed in the last standard section of tube. Turbulator is not required on the BH-125/150/175/200. For installation, *see Page 20, Step 6.4*





Flex Gas Line with Shut Off Cock

5.1 Standard Parts List

Table 1: Contents of BH-Series Burner Carton

Part No.	Description	BH-40	BH-60	BH-80	BH-100	BH-115	BH-125	BH-140	BH-150	BH-175	BH-200
BN71XXXXX	Burner (Rate and Fuel Varies)	1	1	1	1	1	1	1	1	1	1
90709700	Blower Assembly with Cord	1	1	1	1	1	1	1	1	1	1
02568200	Gasket (Burner to Burner Tube)	1	1	1	1	1	1	1	1	1	1
90709801	Gasket (Blower to Burner)	1	1	1	1	1	1	1	1	1	1
BNBH170101NA	Installation, Operation and Service Manual	1	1	1	1	1	1	1	1	1	1
91201708	Pipe Nipple (Black) 1/2" NPT x 4"	1	1	1	1	1	1	1	1	1	1
94273914	Hex Head Bolts 5/16" - 18 Rolok	4	4	4	4	4	4	4	4	4	4
96411600	Split Lock Washer	4	4	4	4	4	4	4	4	4	4
*91412200	Flexible Stainless Steel Gas Hose, 1/2" NPT (US Models Only)	1	1	1	1	1	1	-	-	-	-
*91412204	Flexible Stainless Steel Gas Hose, 3/4" NPT (US Models Only)	-	-	-	-	-	-	1	1	1	1
91907302	S-Hooks	2	2	2	2	2	2	2	2	2	2
91911700	Outside Air Collar	1	1	1	1	1	1	1	1	1	1
94118106	#8 x 3/8 Hex Washer Head (for Outside Air Collar)	3	3	3	3	3	3	3	3	3	3
92311800	Keps Nut	4	4	4	4	4	4	4	4	4	4
03051503	Turbulator Adapter	1	1	1	1	1	-	1	-	-	-
03051504	Turbulator 2.5' (76 cm), Aluminized Steel	2	4	4	1	3	-	1	-	-	-
03051505	Turbulator 2.5' (76 cm), Stainless Steel	1	-	-	-	-	-	-	-	-	-

*Canadian models: Rubber (Type 1) Gas Hoses available as an accessory. *See Page 41*.

Table 2: Contents of Core and Extension Packages

		Core Packages							Extension Packages							
		Hot Rolled			Aluminized				Hot Rolled				Aluminized			
Part No.	Description	20' (6m)	30' (9m)	40' (12m)	10' (3m)	20' (6m)	30' (9m)	40' (12m)	10' (3m)	20' (6m)	30' (9m)	40' (12m)	10' (3m)	20' (6m)	30' (9m)	40' (12m)
91409300	Tube, Hot Rolled Steel, 10' (3 m)	1	2	3	-	-	-	-	1	2	3	4	-	-	-	-
91409408	Tube, HT Aluminized, 10' (3 m)	-	-	-	-	1	2	3	-	-	-	-	1	2	3	4
03051101	Burner Tube, ALUMI-THERM® Steel, 10' (3 m)	-	1	1	-	-	1	1	-	-	-	-	-	-	-	-
03051601	Burner Tube, HT ALUMI-THERM® Steel, 10' (3 m)	1	-	-	1	1	-	-	-	-	-	-	-	-	-	-
01312700	Coupling Assembly	1	2	3	-	1	2	3	1	2	3	4	1	2	3	4
02750303	Standard Reflector, 8' (3.5 m)	3	4	6	2	3	4	6	2	3	4	6	2	3	4	6
02750800	End Cap	2	2	2	2	2	2	2	-	-	-	-	-	-	-	-
03090100	Tube and Reflector Hanger	3	4	5	2	3	4	5	1	2	3	4	1	2	3	4
91907302	S-Hook	3	4	5	2	3	4	5	1	2	3	4	1	2	3	4
03050010	Reflector Support Package (Strap, Wire Form, Screws)	2	3	5	1	2	3	5	2	3	4	6	2	3	4	6
91107720	U-Clip Package	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
90502700	Vent Adapter	1	1	1	1	1	1	1	-	-	-	-	-	-	-	-
01318901	Tube Clamp Package	1	1	1	1	1	1	1	-	-	-	-	-	-	-	-
	Part Number	CP20HRS	CP30HRS	CP40HRS	CP10ALUM	CP20ALUM	CP30ALUM	CP40ALUM	EXP10HRS	EXP20HRS	EXP30HRS	EXP40HRS	EXP10ALUM	EXP20ALUM	EXP30ALUM	EXP40ALUM

Table 3: BH-Series Component Package Guide

Model	Tubing Length	Core Packages	
	Minimum	Standard	Aluminized
BH-40	10' (3 m)	-	CP10ALUM
BH-60	20' (6 m)	CP20HRS	CP20ALUM
BH-80	20' (6 m)	CP20HRS	CP20ALUM
BH-100	30' (9 m)	CP30HRS	CP30ALUM
BH-115	30' (9 m)	CP30HRS	CP30ALUM
BH-125	40' (12 m)	CP40HRS	CP40ALUM
BH-140	40' (12 m)	CP40HRS	CP40ALUM
BH-150	50' (15 m)	CP30HRS + EXP20HRS	CP30ALUM + EXP20ALUM
BH-175	50' (15 m)	CP30HRS + EXP20HRS	CP30ALUM + EXP20ALUM
BH-200	60' (18 m)	CP30HRS + EXP30HRS	CP30ALUM + EXP30ALUM

Additional tubing length may be added to heater. Tubing must be heat-treated, aluminized or porcelain coated. Any additional tubing lengths are considered as vent length for length determination. Maximum venting length for minimum heater length is 45' (13.7 m) total.

SECTION 6: HEATER INSTALLATION

⚠ WARNING

Severe Injury Hazard

Secure burner to burner tube with bolts and lockwashers.

Hang heater with materials with a minimum working load of 75 lbs (33 kg).

Failure to follow these instructions can result in death, injury or property damage.

⚠ WARNING

Cut/Pinch Hazard

Wear protective gear during installation, operation and service.

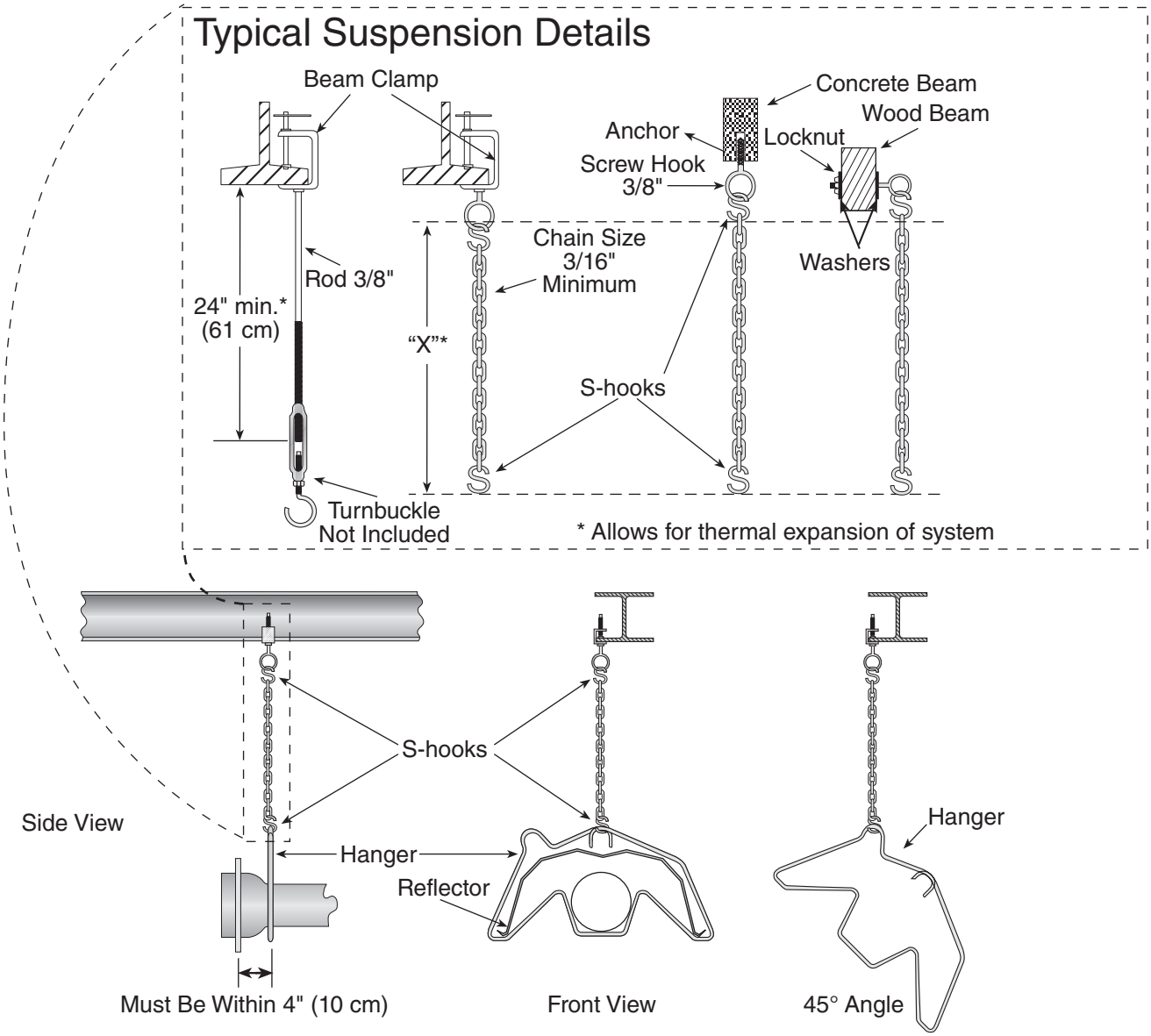
Edges are sharp.

Failure to follow these instructions can result in injury.

To ensure your safety and comply with the terms of the warranty, all units must be installed in accordance with these instructions.
The gas or the electrical supply lines must not be used to support the heater.
Do not locate the gas or electric supply lines directly over the path of the flue products from the heater.
The heater must be installed in a location that it is readily accessible for servicing.
The heaters must be installed in accordance with clearances to combustibles as indicated on the rating plate and in this instruction manual.
The minimum and maximum gas inlet pressures must be maintained as indicated on the rating plate.
Typical installation configurations are shown *on Page 14, Figure 14*.

Expansion and contraction of the tube dictates that the minimum suspension lengths must be maintained. *See table on Page 14, Figure 14*.

FIGURE 14: Critical Hanger Placement



Description	Part Number
S-Hook	91907302
Tube/Reflector Hanger	03090100

Run Length	Typical Expansion	Minimum "X" Length
10' (3 m) - 50' (15.2 m)	±1" (3 cm)	12" (30.5 cm)
51' (15.5 m) - 60' (18.3 m)	±2" (5 cm)	18" (45.7 cm)
61' (18.6 m) - 80' (24.4 m)	±3" (8 cm)	24" (61 cm)

FIGURE 15: Linear Heater Assembly Overview

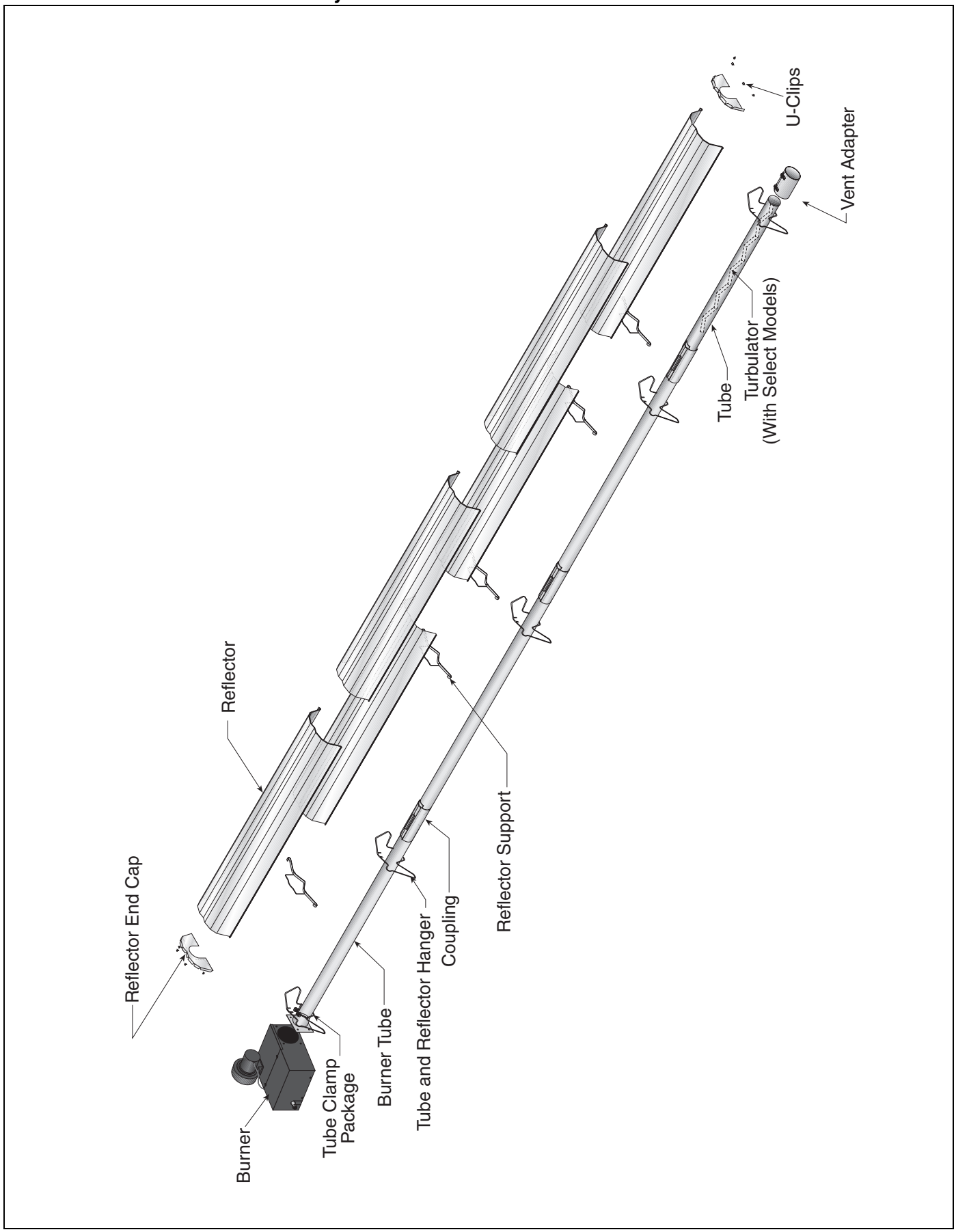


FIGURE 16: Linear Heater Layout Overview

LEGEND

- Burner
- Reflector
- Tube
- Tube/Reflector Hanger
- Coupling Assembly
- Vent Adapter

a = 14" (36 cm)
reflector width (not shown)

b = 2" (5 cm)
end cap to burner

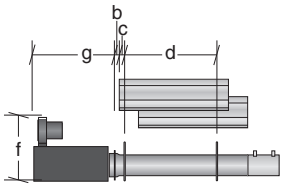
c = 2" (5 cm)
end cap to hanger

d = 7' 6" (2.3 m)
distance first hanger

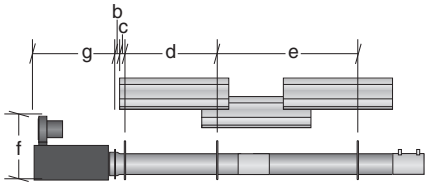
e = 10' (3 m)
distance between hangers

f = 12.5" (32 cm)
burner height

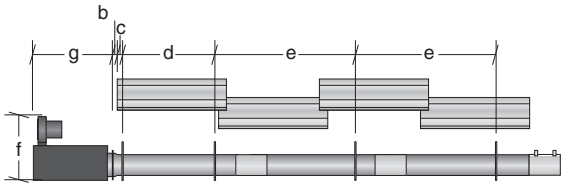
g = 11" (28 cm)
burner length



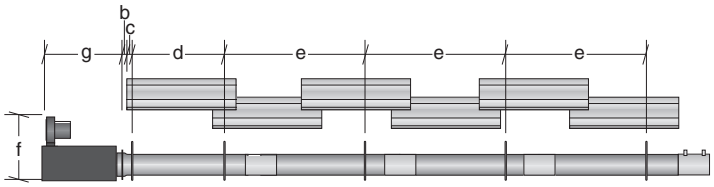
10' (3 m) Tube Length



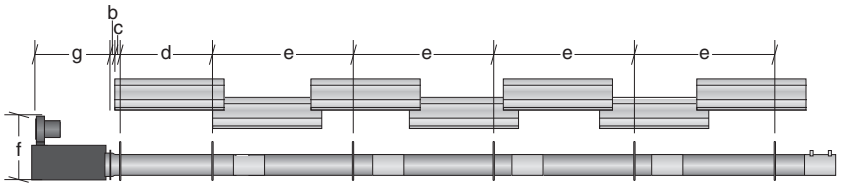
20' (6.1 m) Tube Length



30' (9.1 m) Tube Length

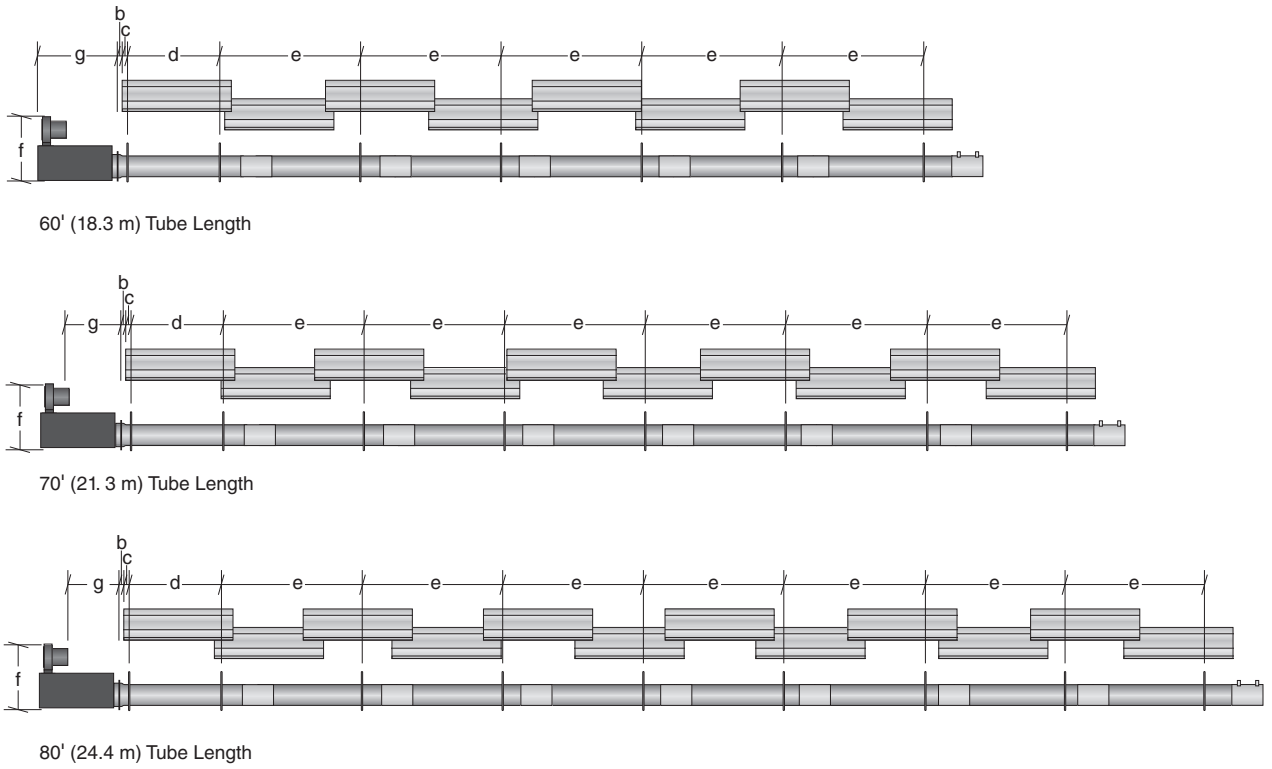


40' (12.2 m) Tube Length

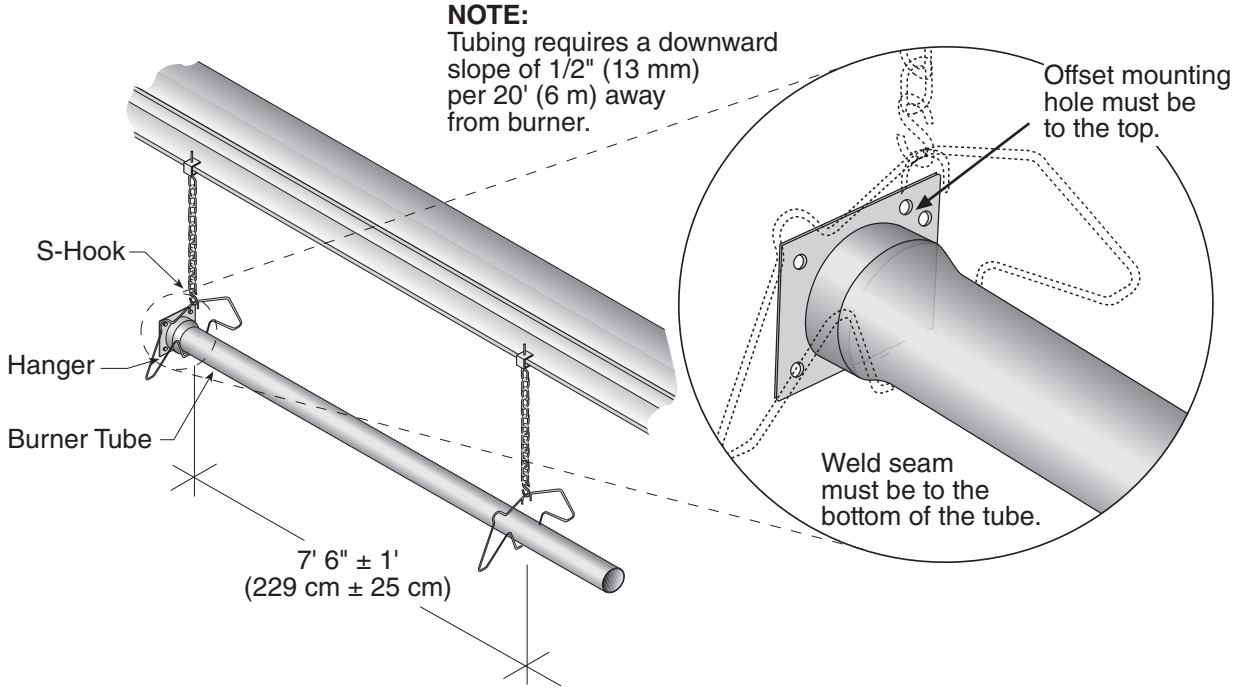


50' (15.2 m) Tube Length

FIGURE 17: Linear Heater Layout Overview (Continued)

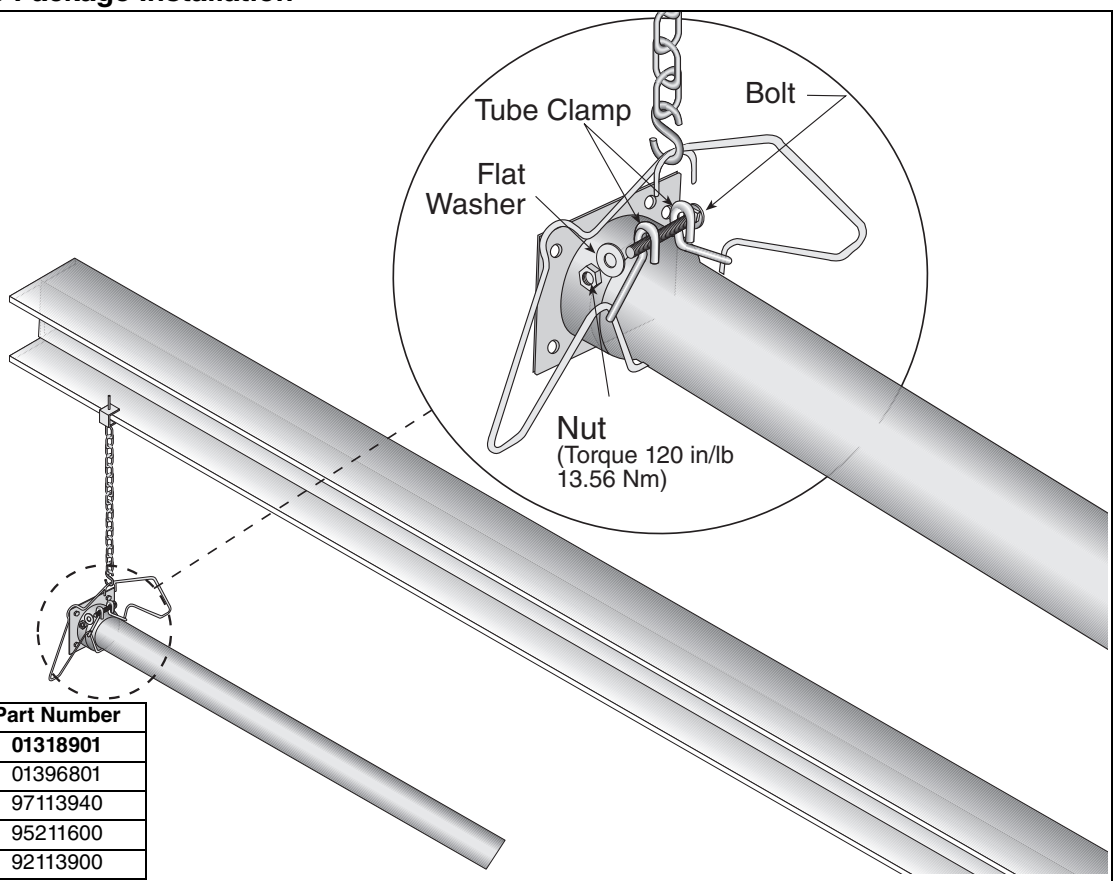


Step 6.1 Burner Tube Installation


NOTE:
Tubing requires a downward slope of 1/2" (13 mm) per 20' (6 m) away from burner.
Offset mounting hole must be to the top.
S-Hook
Hanger
Burner Tube
Weld seam must be to the bottom of the tube.
7' 6" ± 1'
(229 cm ± 25 cm)

Description	Part Number
Burner Tube	03051XXX
S-Hook	91907302
Tube/Reflector Hanger	03090100

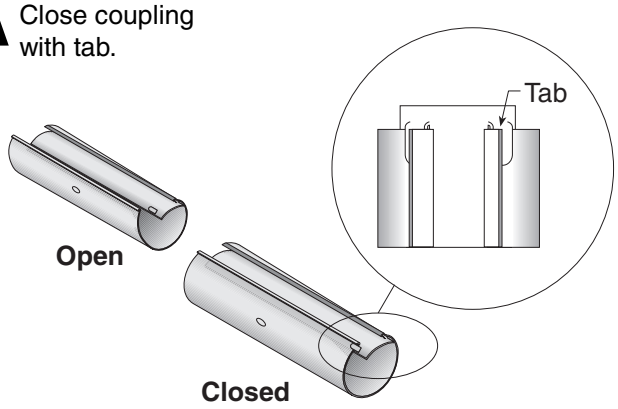
Step 6.2 Tube Clamp Package Installation



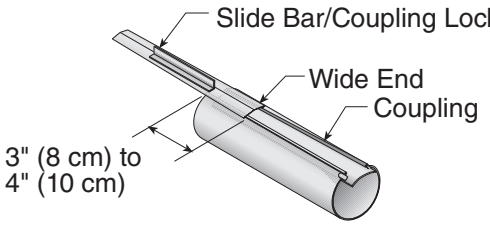
Description	Part Number
Tube Clamp Package	**01318901**
Tube Clamp	01396801
Bolt	97113940
Flat Washer	95211600
Nut	92113900

Step 6.3 Coupling and Tube Assembly

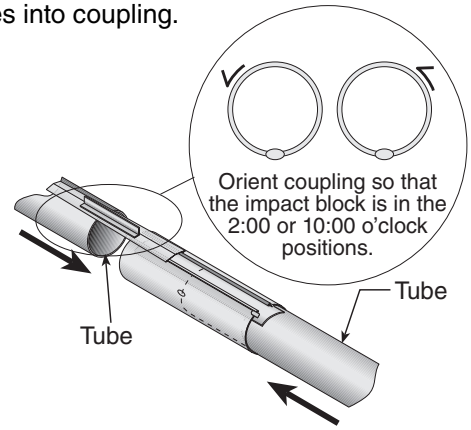
A Close coupling with tab.



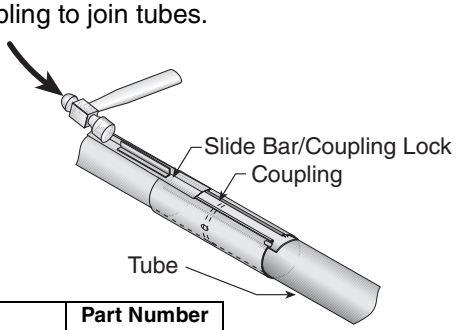
B Start slide bar/coupling lock onto coupling.



C Insert tubes into coupling.



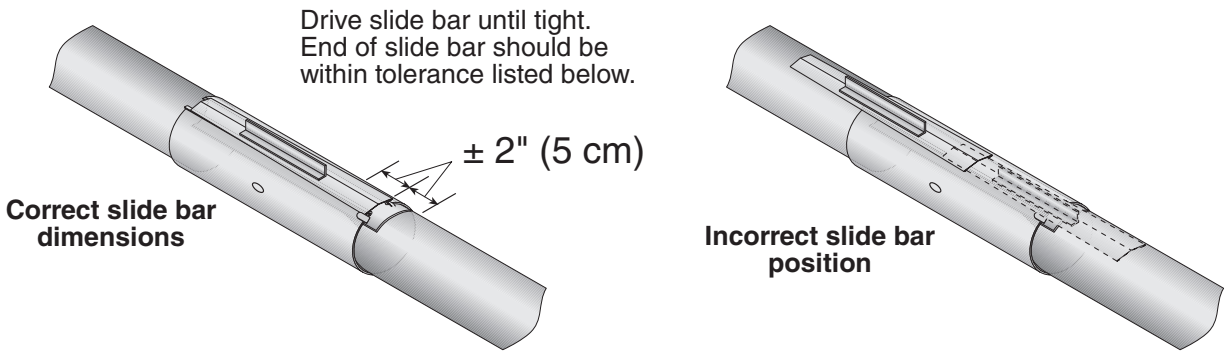
D Tighten coupling to join tubes.



Description	Part Number
Coupling	01329600
Slide Bar/Coupling Lock	01329700
Tube	91409XXX

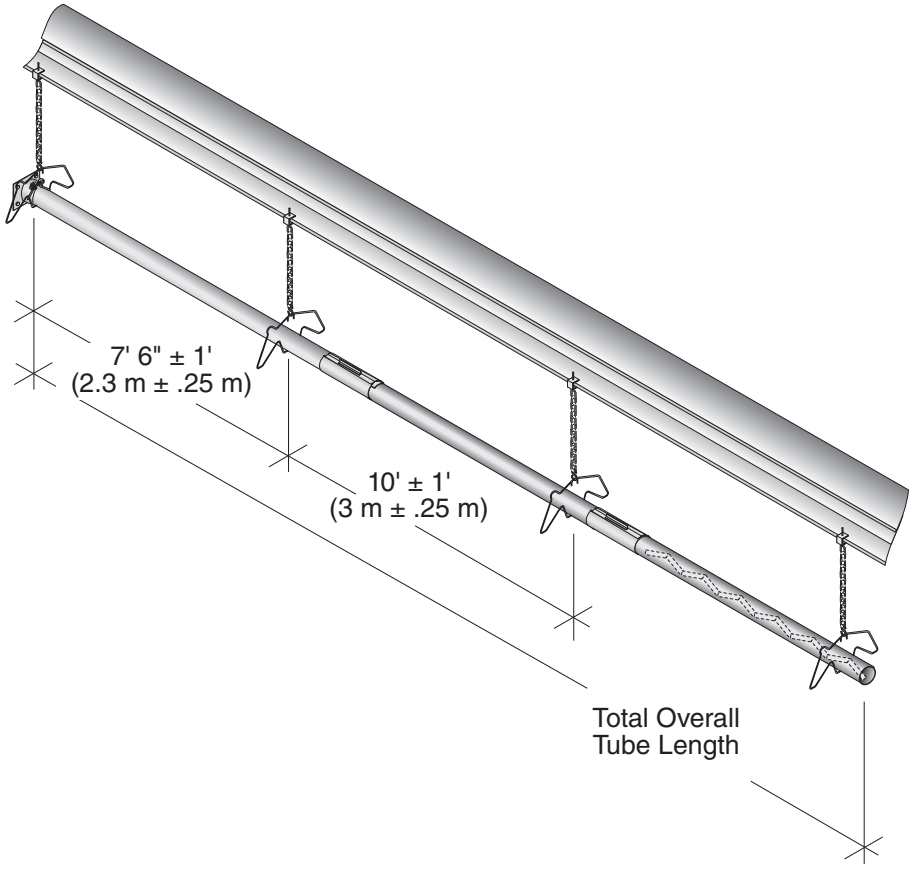
Step 6.3.1 Coupling and Tube Assembly (Continued)

Tighten slide bar as shown below.



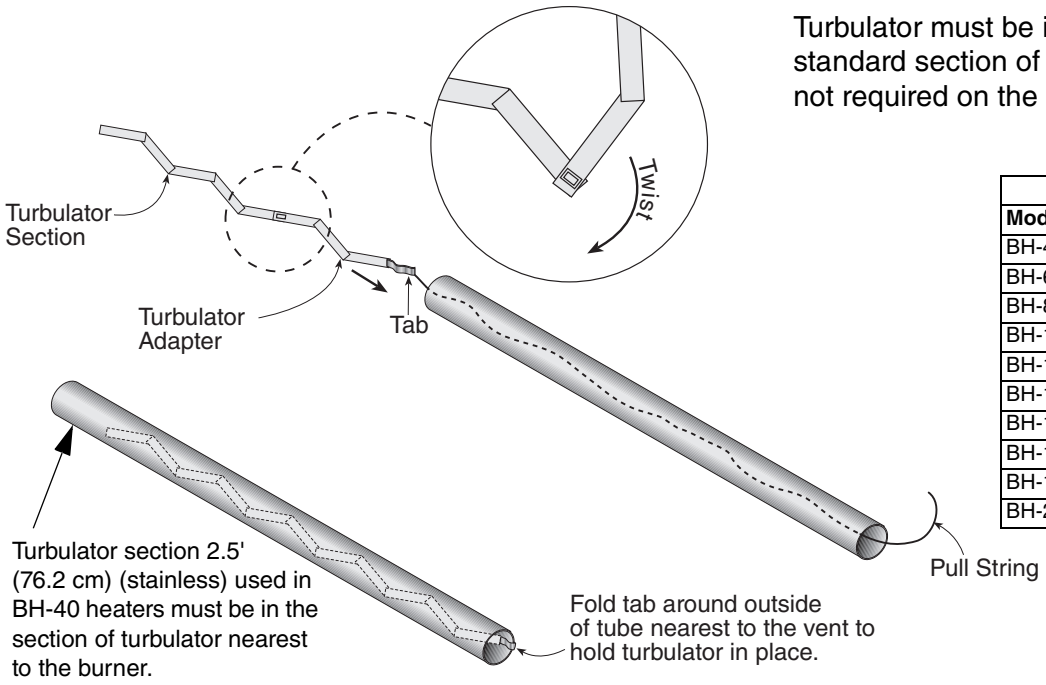
- **Repeat Step 6.3 A - D until all tubes are assembled.** *See Page 19, Step 6.3.2***.**

Step 6.3.2 Coupling and Tube Assembly (Continued)



Model	Tube Length Minimum
BH-40	10' (3 m)
BH-60	20' (6 m)
BH-80	20' (6 m)
BH-100	30' (9 m)
BH-115	30' (9 m)
BH-125	40' (12 m)
BH-140	40' (12 m)
BH-150	50' (15 m)
BH-175	50' (15 m)
BH-200	60' (18 m)

Step 6.4 Turbulator Installation



Turbulator must be installed in the last standard section of tube. Turbulator is not required on the BH-125/150/175/200.

Turbulator Installation	
Model	**Tube Section**
BH-40	1st 10' (3 m) Section
BH-60	2nd 10' (3 m) Section
BH-80	2nd 10' (3 m) Section
BH-100	3rd 10' (3 m) Section
BH-115	3rd 10' (3 m) Section
BH-125	N/A
BH-140	4th 10' (3 m) Section
BH-150	N/A
BH-175	N/A
BH-200	N/A

Turbulator section 2.5' (76.2 cm) (stainless) used in BH-40 heaters must be in the section of turbulator nearest to the burner.

Fold tab around outside of tube nearest to the vent to hold turbulator in place.

Description	Part Number
Turbulator Adapter 2.5' (76.2 cm)	03051503
Turbulator Section 2' (61 cm)	03051504
Turbulator Section 2.5' (76.2 cm)(Stainless)	03051505
Tube	91409XXX

Step 6.5 Reflector Installation

⚠ WARNING

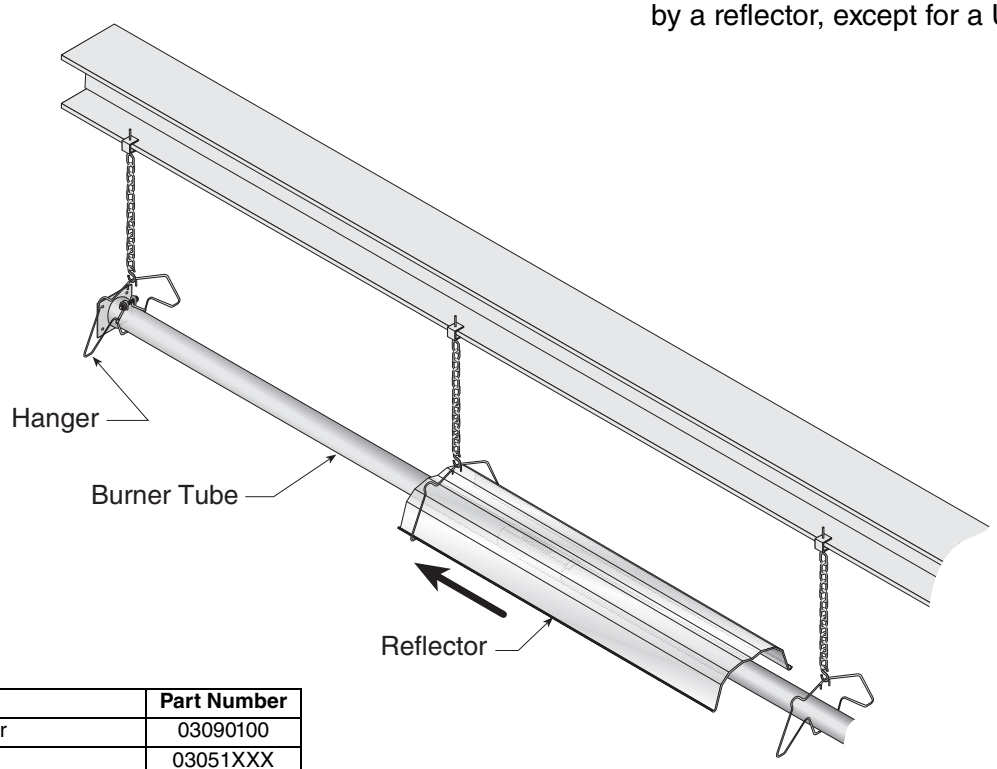
Fire Hazard

Support reflector with reflector hanger and support strap.

Reflector must not touch tube.

Failure to follow these instructions can result in death, injury or property damage.

NOTE: All tube surfaces must be covered by a reflector, except for a U-tube.



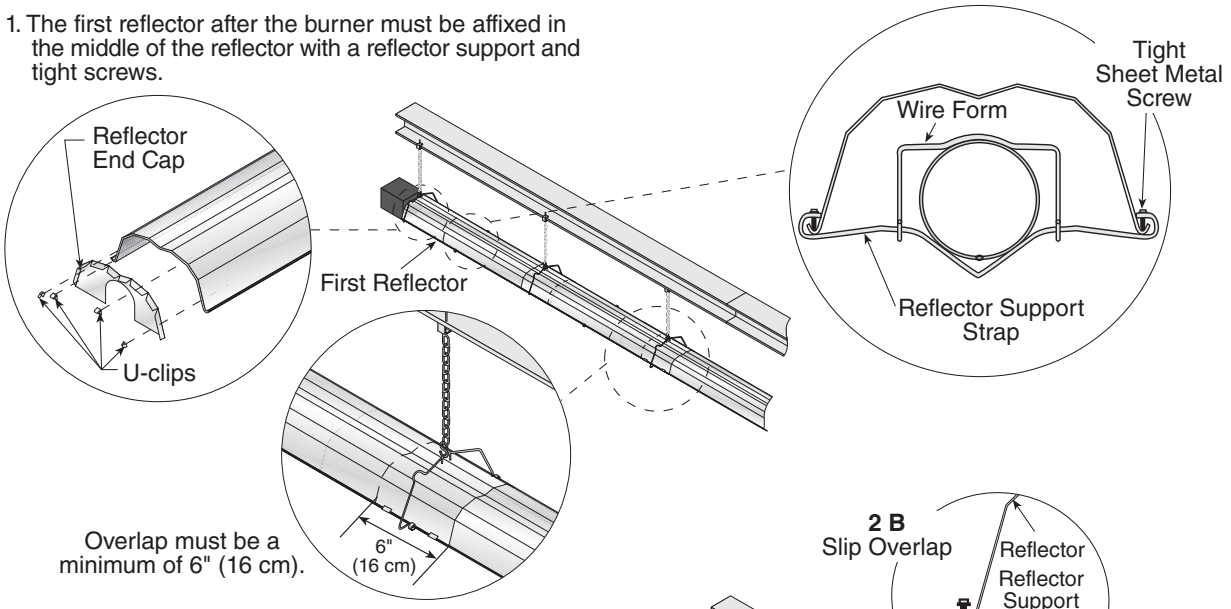
Description	Part Number
Tube/Reflector Hanger	03090100
Burner Tube	03051XXX
Reflector	02750303

Step 6.5.1 Reflector, U-Clip and Reflector Support Installation

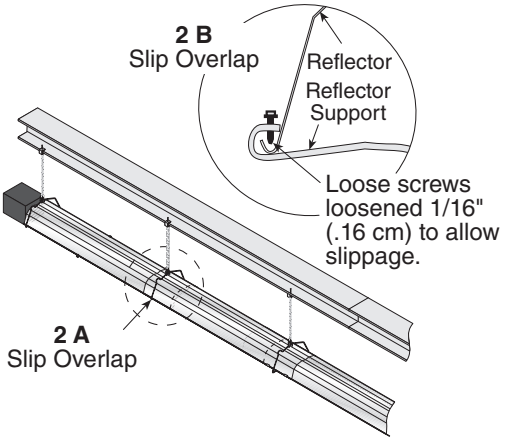
The pictorial drawings of the heater construction in *Section 6* are schematic only and provide a general guideline of where hangers, reflector supports and U-clips are to be installed.

To ensure proper expansion and contraction movement of the reflectors, a combination of U-clips and reflector supports are used. The positioning of reflector supports and U-clips depend on the individual installation. Use either pop rivets or sheet metal screws instead of u-clips when installing end caps and joint pieces in areas where impact and high wind may be a factor. The following rules must be observed.

1. The first reflector after the burner must be affixed in the middle of the reflector with a reflector support and tight screws.

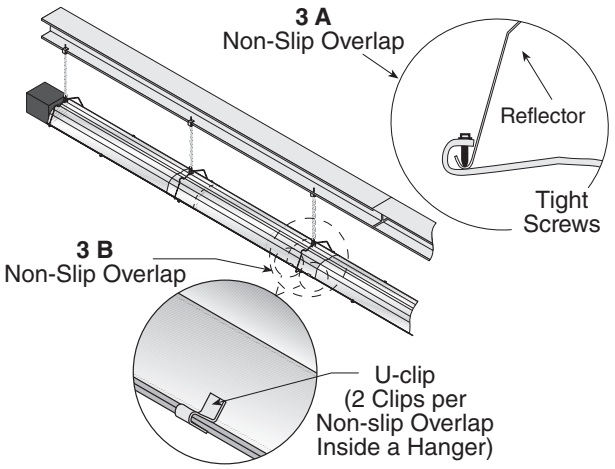


2. The overlap at the first and second reflector is a **slip overlap.** Thereafter, every third reflector joint is a slip overlap. A slip overlap is achieved by either:
   a.) both reflectors lay inside a hanger. (No reflector support needed.)
   b.) using a reflector support with loose screws at the reflector overlap.



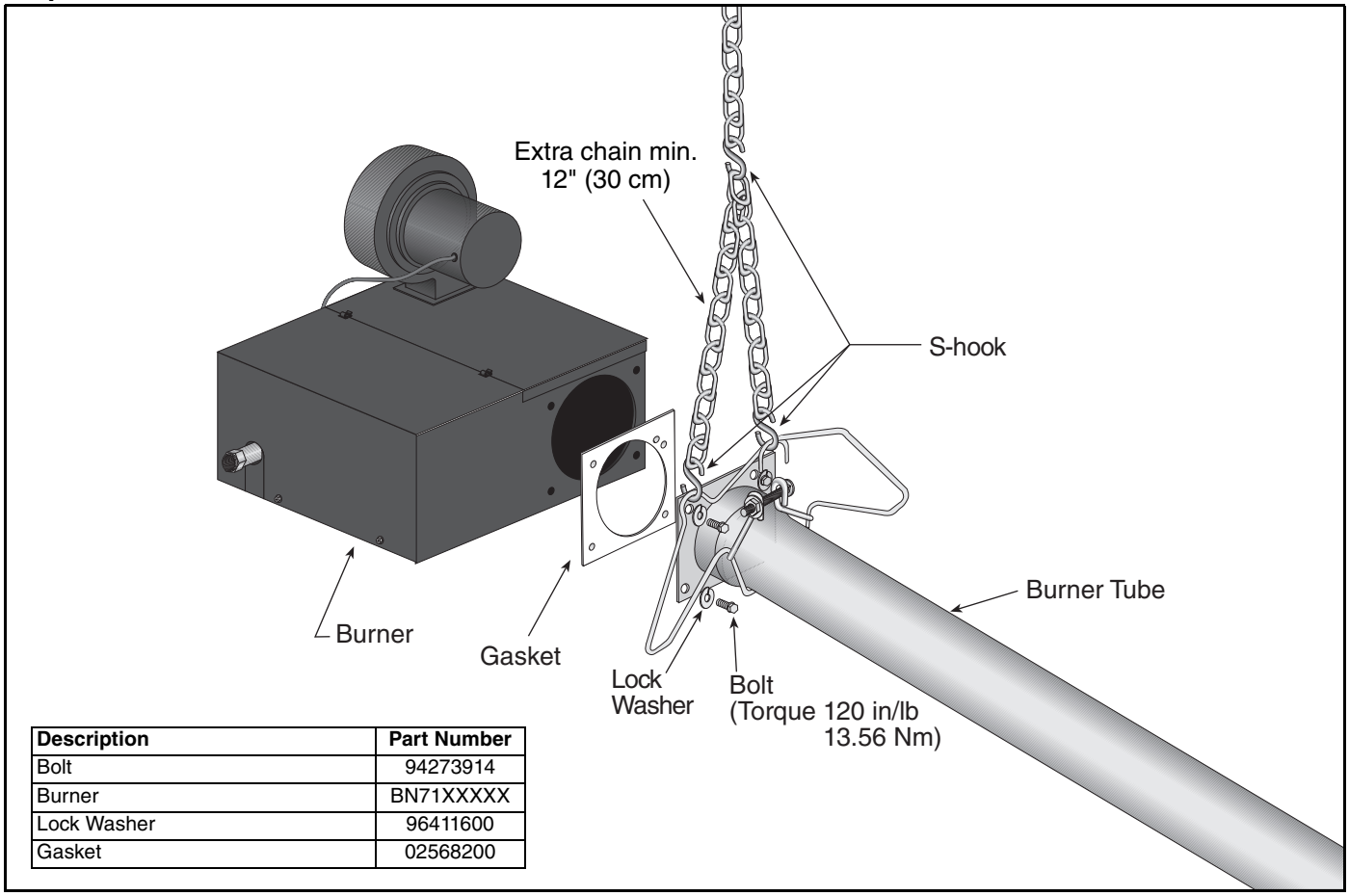
3. The remaining reflector overlaps require a **non-slip overlap** connection. To affix the reflectors together in a non-slip overlap either:
   a.) use reflector support and tight screws.
   b.) if both reflectors lay inside a hanger, u-clips or sheet metal screws may be used.

   This section of three reflectors joined together must be affixed to the tube with at least one reflector support with tight screws.



Description	Part Number
Reflector Support Package	**03050010**
Wire Form	91908004
Reflector Support Strap	03050000
Screw #8 x 3/4"	94320812
U-Clip Package	91107720
Reflector End Cap	027508XX

Step 6.6 Burner Installation



Description	Part Number
Bolt	94273914
Burner	BN71XXXXX
Lock Washer	96411600
Gasket	02568200

SECTION 7: OPTIONAL HEATER ACCESSORIES

⚠WARNING

Cut/Pinch Hazard

Wear protective gear during installation, operation and service.

Edges are sharp.

Failure to follow these instructions can result in injury.

7.1 U-Tube Configuration

Heaters (except BH-40) are approved for optional U-tube configurations.

The U-tube may be installed in either a standard horizontal position, a 45° position or in an opposite 45° position as shown *on Page 6, Figure 7 through Page 7, Figure 9*. When using a U-tube configuration, the following additional rules must be adhered to:

- A minimum of 10' (3 m) on BH-60/80 and a minimum of 15' (4.5 m) on BH-100/115/125/140/150/175/200 is required between the burner and the U-tube.
- The correct turbulator (*See Page 20, Step 6.4*) must be installed in the last standard section of the tube.
- The burner must never be operated in a tilted position.
- The heater must be properly supported at all locations. *See Page 26, Figure 19*.

FIGURE 18: U-Tube Heater Assembly Overview

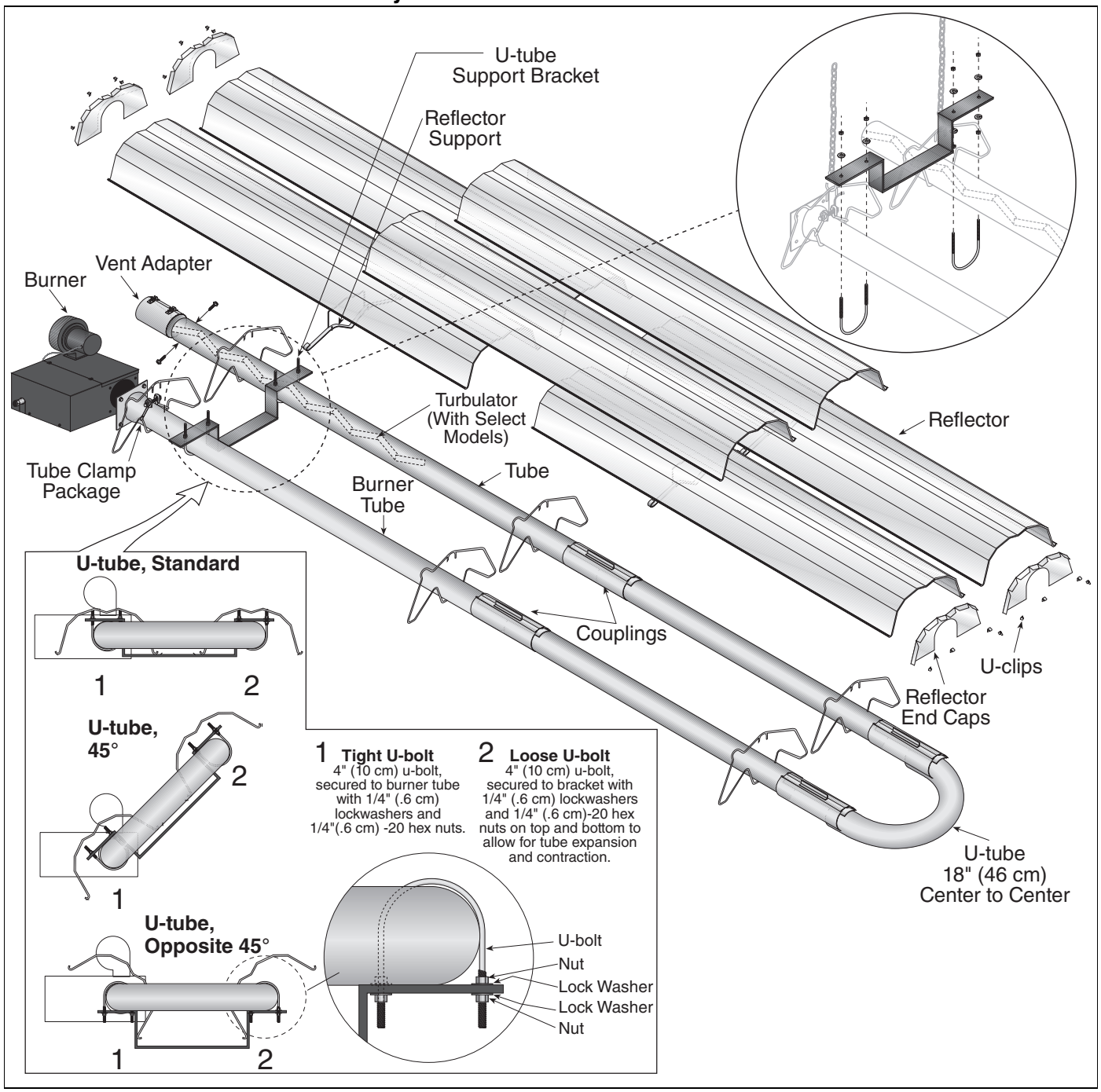


FIGURE 19: U-Tube Heater Layout Overview

LEGEND

- Burner
- Reflector
- Tube 10' (3.0 m)
- Tube 5' (1.5 m)**
- Tube/Reflector Hanger
- Coupling Assembly
- U-tube
- Vent Adapter (Not Shown)

a = 14" (36 cm)
Reflector Width (Not Shown)

b = 2" (5 cm)
End Cap to Burner

c = 2" (5 cm)
End Cap to Hanger

d = 7' 6" (2.3 m)
Distance First Hanger

e = 10' (3.0 m)
Distance Between Hangers

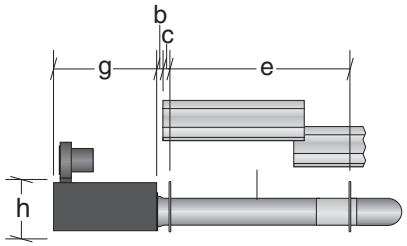
f = 5' (1.5 m)
Distance Between Last Full Tube Hanger and Half Tube Hanger

g = 12.5" (32 cm) Burner Length

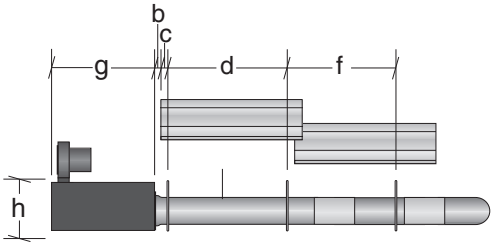
h = 11" (28 cm) Burner Height

* Requires the last **reflector** before the u-tube to be cut in half for use on both sides.

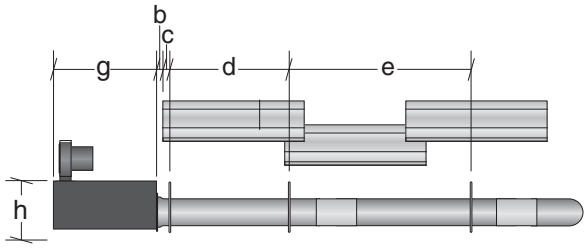
** Requires the last **tube** before the u-tube to be cut in half for use on both sides.



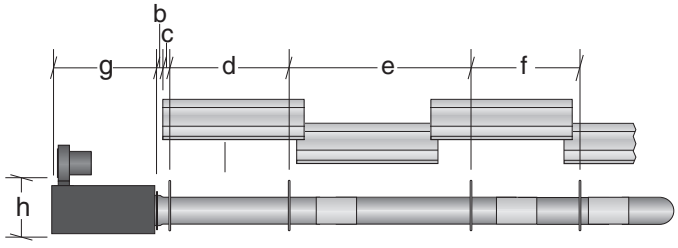
20' (6.1 m) Tube Length*



30' (9.1 m) Tube Length**

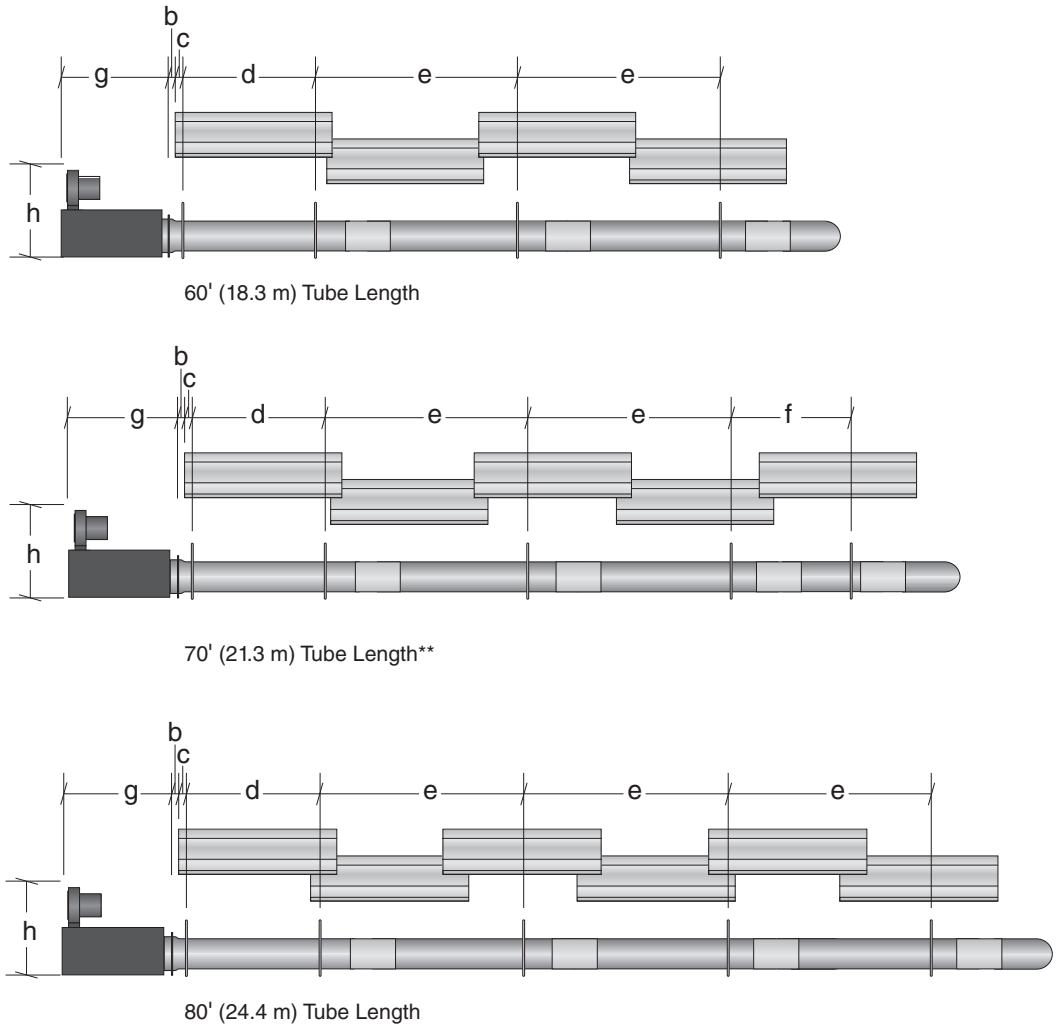


40' (12.2 m) Tube Length



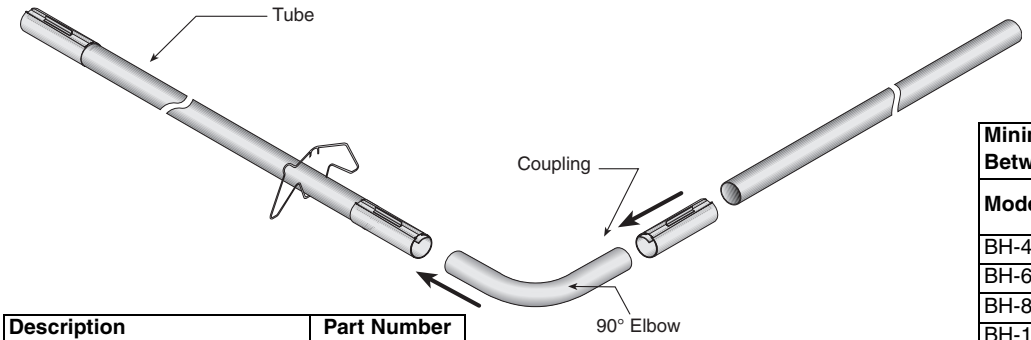
50' (15.2 m) Tube Length* **

FIGURE 20: U-Tube Layout Overview (Continued)



7.2 Elbow Package Configuration

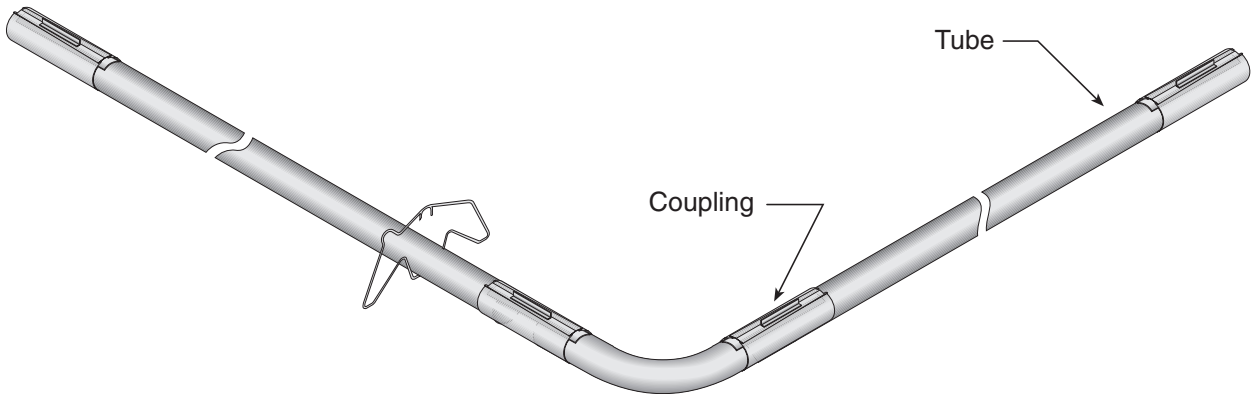
Step 7.2.1 Elbow Installation



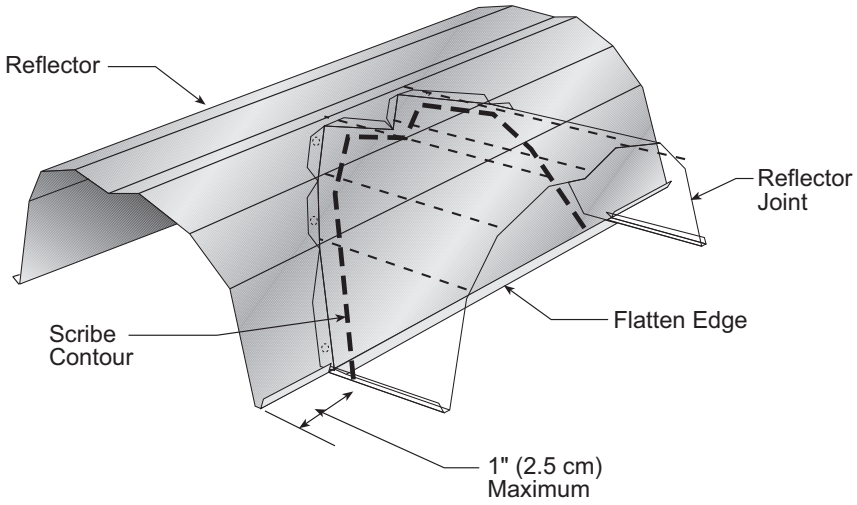
Description	Part Number
Elbow Package	**02718702**
90° Elbow	01335801
Coupling	01312700
Reflector End Cap	02750800
Reflector Joint Piece	02750900
U-Clip Package	**91107720**

Minimum Distance Required Between Burner and Elbow	
Model	**Minimum Distance**
BH-40	10' (3 m)
BH-60	10' (3 m)
BH-80	10' (3 m)
BH-100	15' (4.5 m)
BH-115	15' (4.5 m)
BH-125	15' (4.5 m)
BH-140	15' (4.5 m)
BH-150	15' (4.5 m)
BH-175	15' (4.5 m)
BH-200	15' (4.5 m)

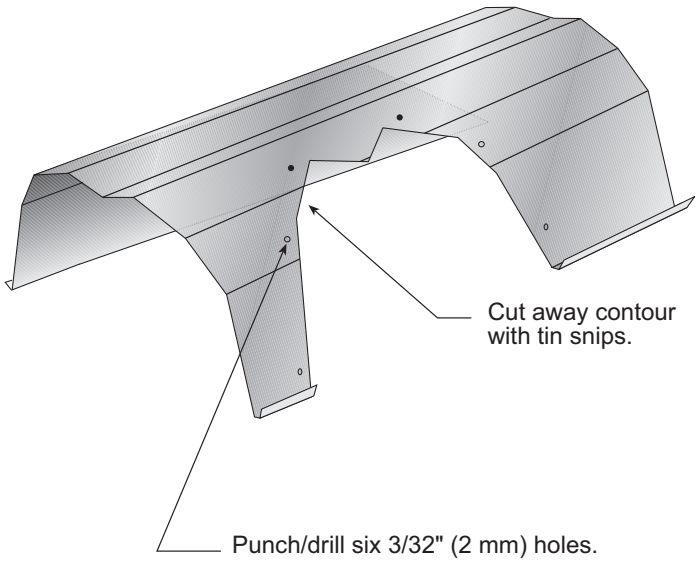
Step 7.2.2 Elbow Installation



Step 7.2.3 Reflector Joint Installation



Step 7.2.4 Reflector Joint Installation



Step 7.2.5 Reflector Joint Detail

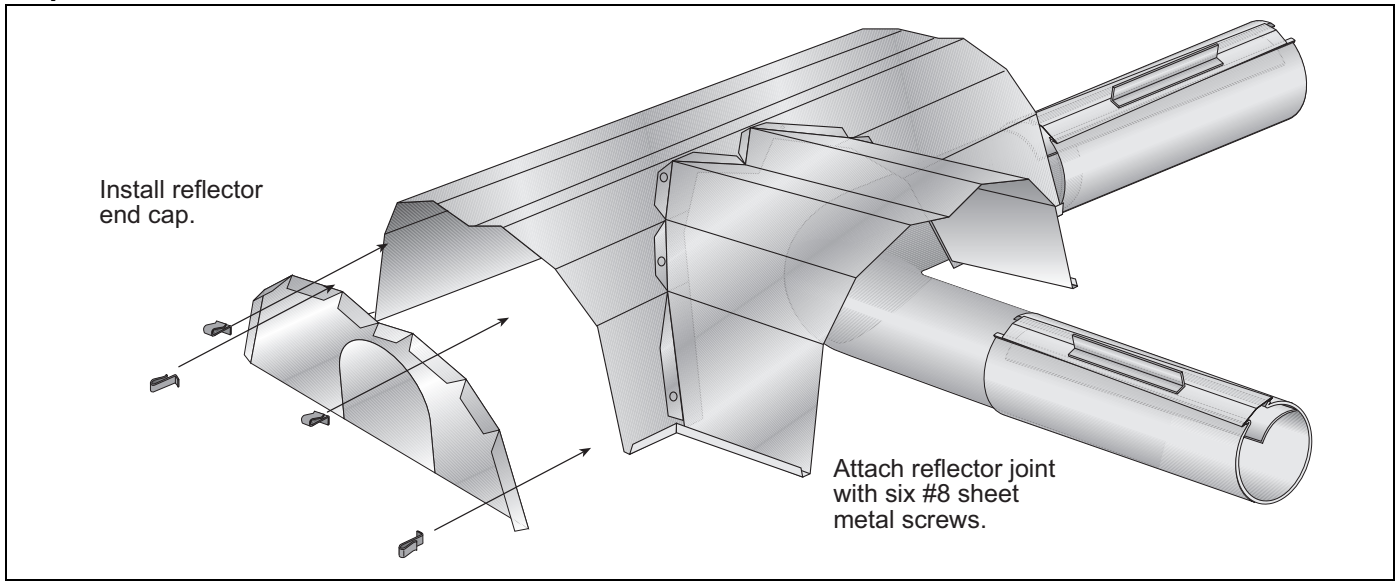
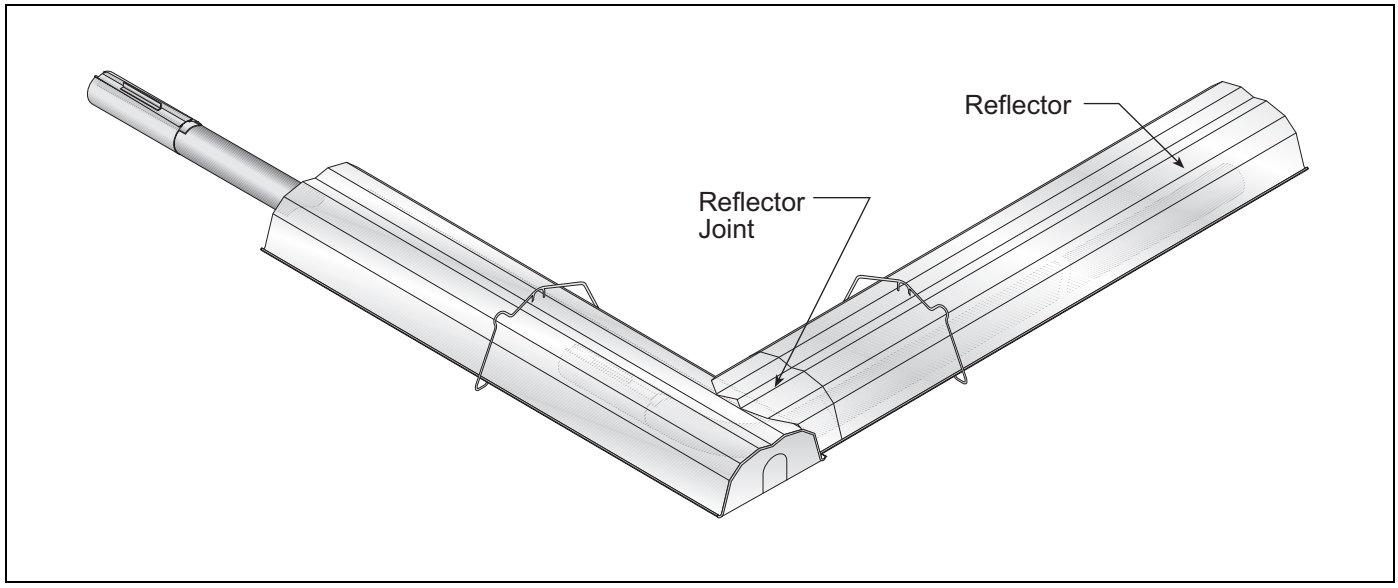
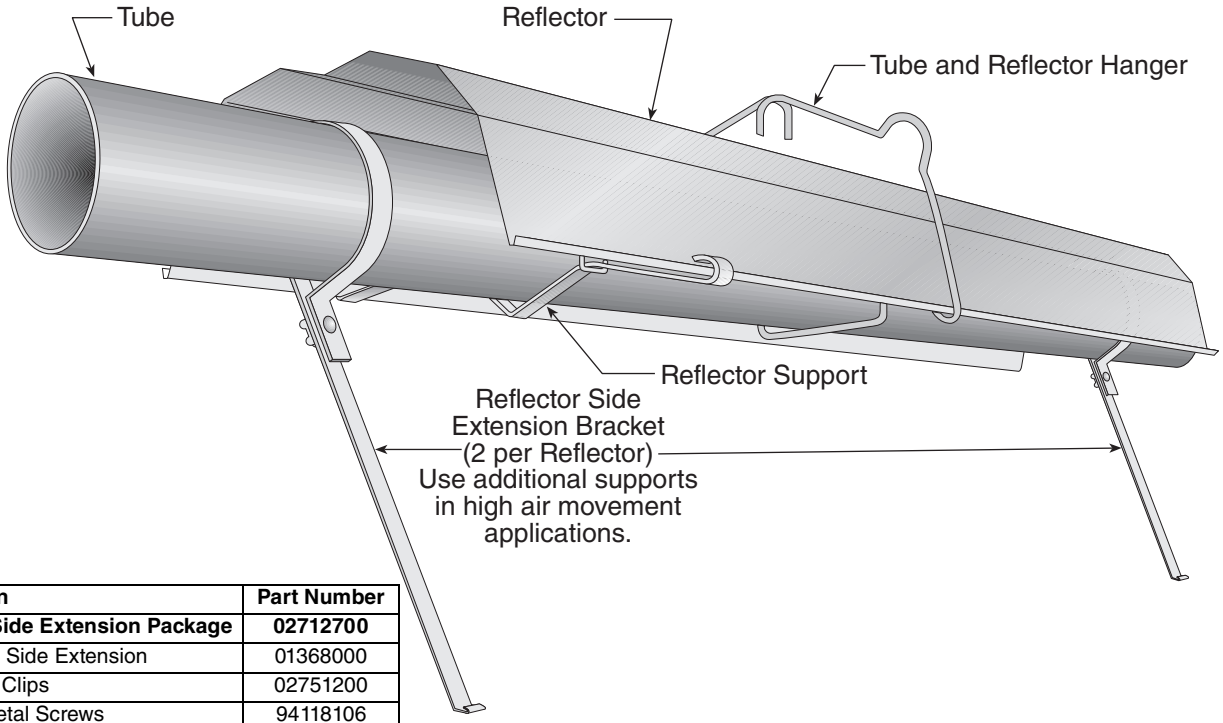


FIGURE 21: Reflector Joint Detail



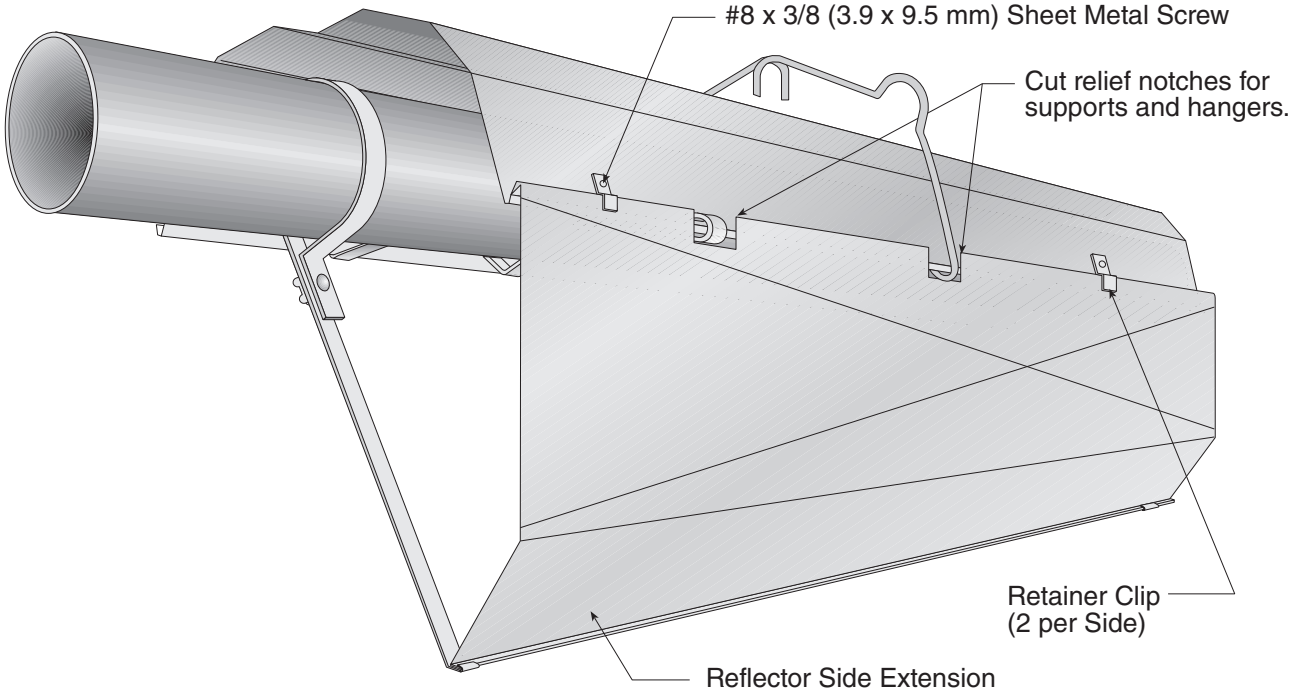
7.3 Reflector Side Extension

Step 7.3.1 Bracket Installation



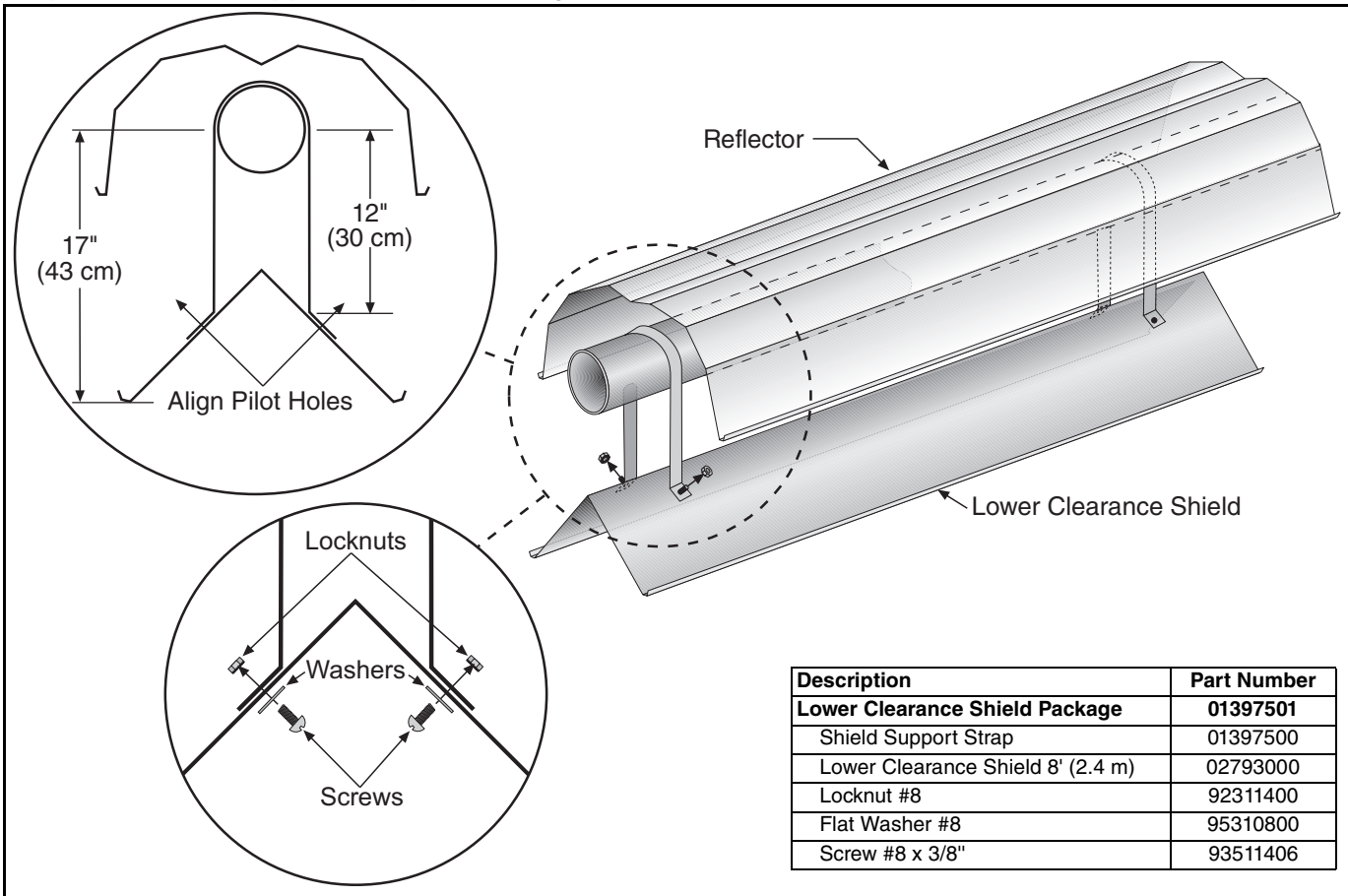
Description	Part Number
Reflector Side Extension Package	**02712700**
Reflector Side Extension	01368000
Retainer Clips	02751200
Sheet Metal Screws	94118106
Order Separately	
Reflector Side Extension Bracket	01329910

Step 7.3.2 Side Reflector Installation


#8 x 3/8 (3.9 x 9.5 mm) Sheet Metal Screw
Cut relief notches for
supports and hangers.
Retainer Clip
(2 per Side)
Reflector Side Extension

7.4 Lower Clearance Shield Installation

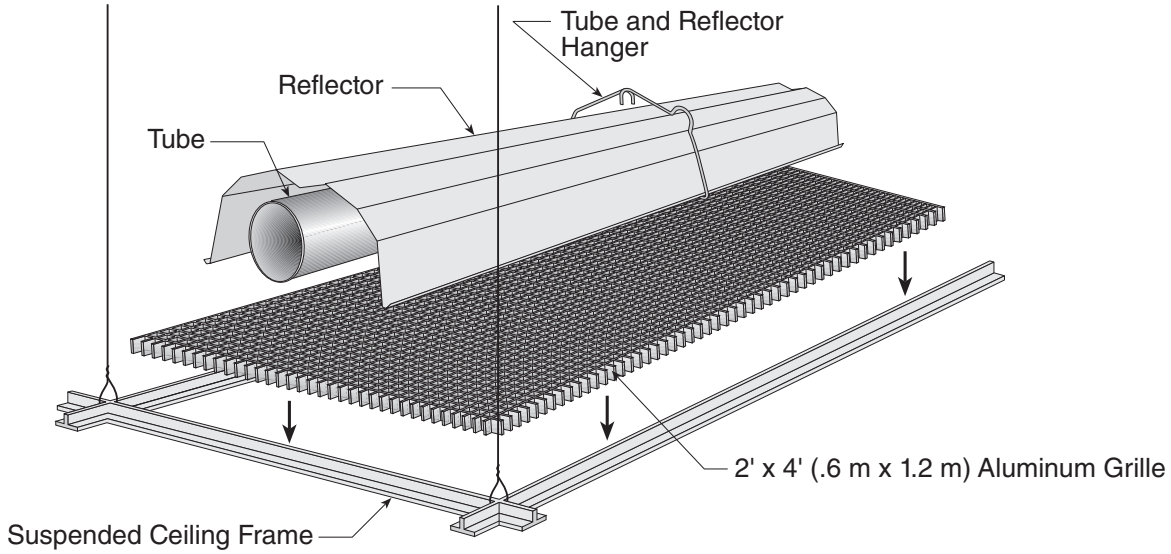
Step 7.4.1 Shield Support Strap Assembly



Description	Part Number
Lower Clearance Shield Package	**01397501**
Shield Support Strap	01397500
Lower Clearance Shield 8' (2.4 m)	02793000
Locknut #8	92311400
Flat Washer #8	95310800
Screw #8 x 3/8"	93511406

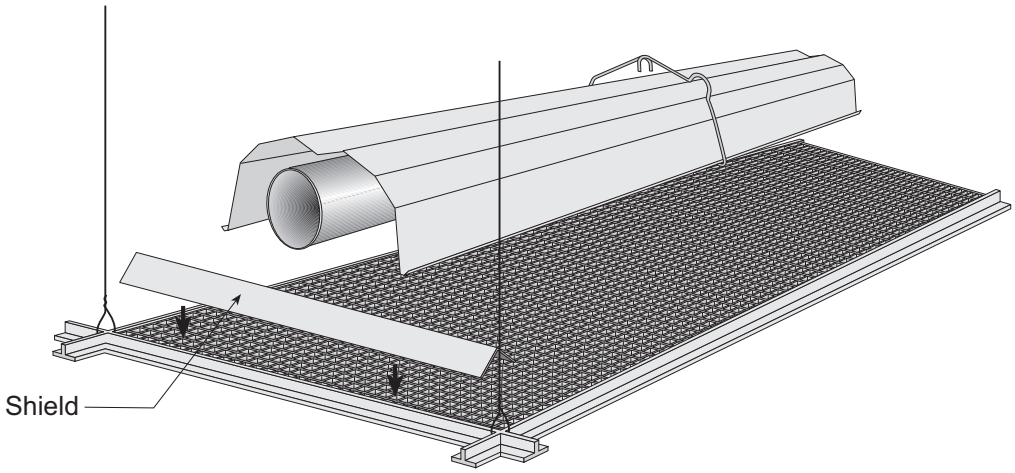
7.5 Two-Foot Decorative Grille Installation

Step 7.5.1 Grille Installation



Description	Part Number
Aluminum Grille 2' x 4' (61 x 122 cm)	91407000

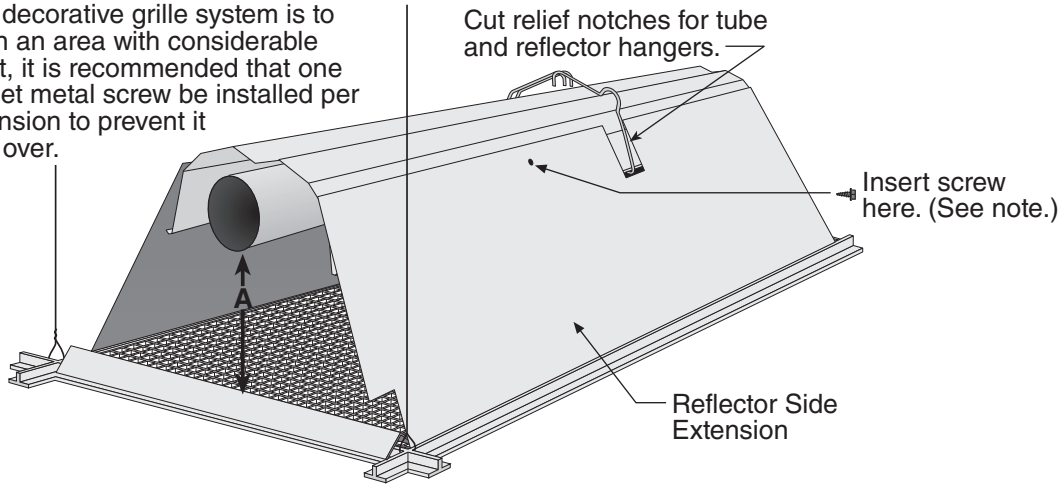
Step 7.5.2 Frame Shield Installation



Description	Part Number
Deco Grille Shield	01365900

Step 7.5.3 Reflector Side Extension Installation for Decorative Grilles

NOTE: If the decorative grille system is to be installed in an area with considerable air movement, it is recommended that one #8 x 3/8" sheet metal screw be installed per reflector extension to prevent it from blowing over.

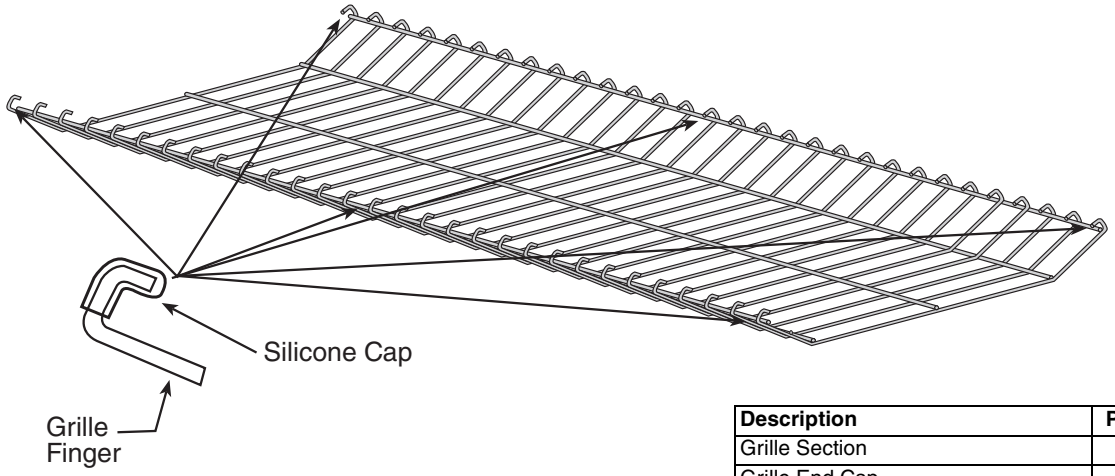


Distance "A"		Extension	
Minimum	Maximum	Part No.	Width
2" (4 cm)	6" (15 cm)	01370408	8" (20 cm)
6" (15 cm)	10" (26 cm)	01370412	12" (30 cm)
10" (26 cm)	14" (37 cm)	01370416	16" (40 cm)

Description	Part Number
Reflector Side Extension	01370412

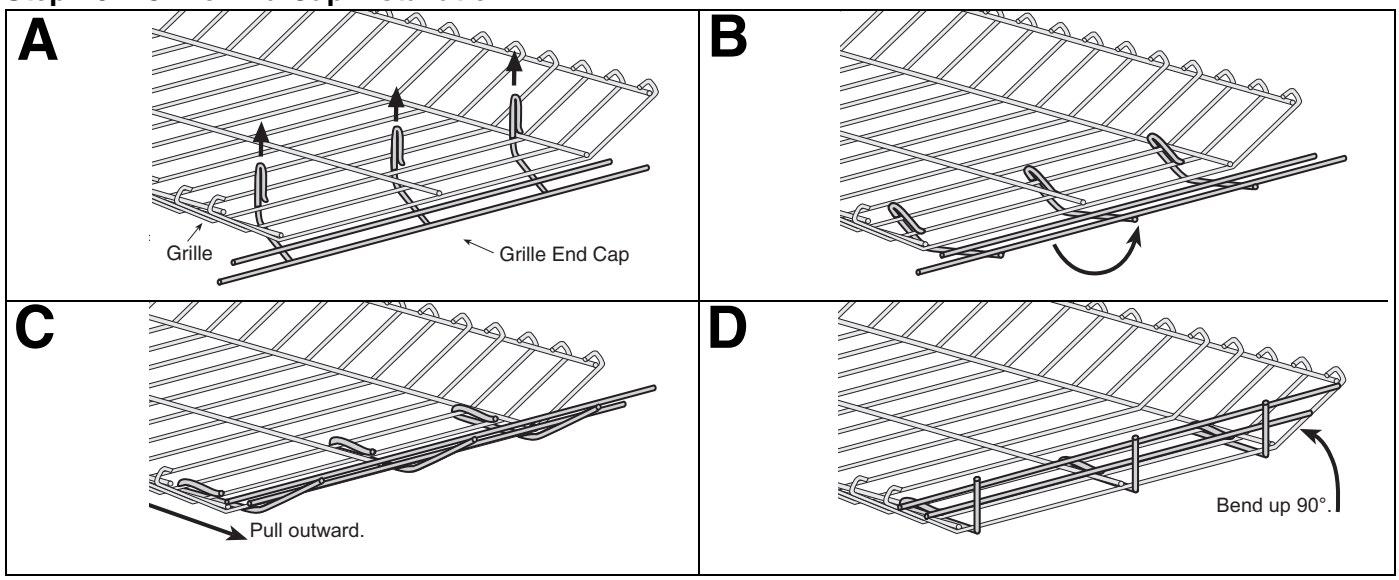
7.6 Protective Grille Installation

Step 7.6.1 Silicone Cap Installation

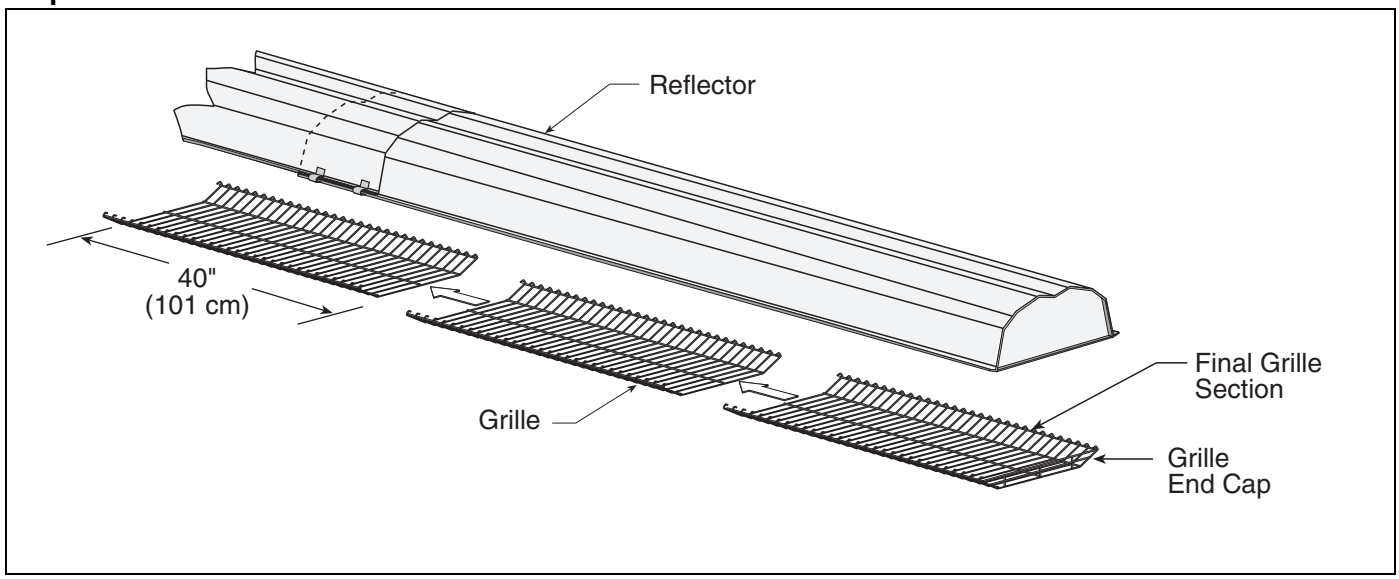


Description	Part Number
Grille Section	08050001
Grille End Cap	08050002
Silicone Cap	91915951-6P

Step 7.6.2 Grille End Cap Installation



Step 7.6.3 Grille Installation



SECTION 8: VENTING

⚠WARNING

Carbon Monoxide Hazard

Heaters installed unvented must be interlocked with sufficient building exhaust.

Heaters must be installed according to the installation manual.

Failure to follow these instructions can result in death or injury.

⚠WARNING

Cut/Pinch Hazard

Wear protective gear during installation, operation and service.

Edges are sharp.

Failure to follow these instructions can result in injury.

8.1 Venting

This heater must be vented in accordance with the rules contained in this manual and with the following national codes and any state, provincial or local codes which may apply:
United States: Refer to National Fuel Gas Code NFPA 54/ANSI Z223.1 - latest revision.
Canada: Refer to Natural Gas and Propane Installation Code CSA B149.1 - latest revision.

Exhaust end of heater will accept a 4'' (10 cm) vent pipe using the vent adapter (P/N 90502700). To prevent leakage of condensation, install the vent adapter with the seam on top and seal the joint using a high temperature silicone sealant.

Any portion of vent pipe passing through a combustible wall must have an approved thimble to conform with the above listed codes.

Vent pipe must be sloped downward away from the heater 1/2'' (1 cm) for every 20' (6 m).

The heater may be individually vented or common vented. When venting horizontally, a maximum of two heaters can be commonly vented. *See Page 37, Section 8.9*. When venting vertically, a maximum of four heaters can be commonly vented. *See Page 38, Section 8.10*.

The heater may also be installed unvented in certain circumstances according to building ventilation codes. Refer to the above codes *and Page 35, Section 8.2* for further information. Unvented operation also requires compliance with the clearances to combustibles given *on Page 8, Figure 12*.

The bottom of the vent or air intake terminal shall not be located less than 1' (0.3 m) above grade level.

The vent shall not terminate less than 7' (2.1 m) above grade where located adjacent to public walkways.

Vent terminal must be installed at a height sufficient to prevent blockage by snow, and building materials protected from degradation by flue gases.

Secure all joints with #8 x 3/8 sheet metal screws. Seal all joints with high temperature silicone sealant.

Vent terminal must be beyond any combustible overhang.

8.1.1 United States Requirements

Vent must terminate at least 3' (0.9 m) above any forced air inlet located within 10' (3.1 m).

Vent must terminate at least 4' (1.2 m) below, 4' (1.2 m) horizontally from, or 1' (0.3 m) above any door, operable window, or gravity air inlet into any building.

8.1.2 Canadian Requirements

The vent shall not terminate within 6' (1.8 m) of a mechanical air supply inlet to any building.
The vent shall not terminate within 3' (0.9 m) of a window or door that can be opened in any building, any non-mechanical air supply inlet to any building, or of the combustion air inlet of any other appliance.

8.2 Unvented Operation

Sufficient ventilation must be provided in the amount of 4 cfm per 1000 Btu/h firing rate (United States); 3 cfm per 1000 Btu/h firing rate (Canada).
Use of optional outside combustion air is not recommended with unvented heaters.

If exhaust fans are used to supply ventilation air, an interlock switch must be used to prevent the heater from coming on when the fans are off. This may be done using a pressure switch.

⚠WARNING

Combustion by-products contain a chemical known to the State of California to cause cancer and birth defects or other reproductive harm.

8.3 Horizontal Venting

In noncombustible walls only, vent terminal (P/N 02537801-1P) may be used.

For 4" (10 cm) vents in either combustible or noncombustible walls, use Tjernlund VH1-4 (P/N 90502100) or equivalent, insulated vent terminal. Follow the manufacturer's instructions for proper installation.

For 6" (15 cm) common vents in either combustible or noncombustible walls, use Tjernlund VH1-6 (P/N 90502101) or equivalent, insulated vent terminal. Follow the manufacturer's instructions for proper installation.

8.4 Vertical Venting

For 4" (10 cm) common vent, an approved vent cap (P/N 90502300) must be used.

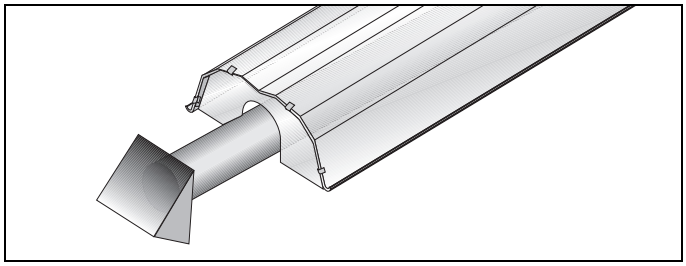
For 6" (15 cm) common vent, an approved vent cap (P/N 90502302) must be used.
For common vertical venting of more than two heaters, *See Page 38, Section 8.10*.

A vent shall not extend less than 2' (0.6m) above the highest point where it passes through a flat roof of a building.

8.5 Unvented Operation Tube Termination

Turndown type vent terminal with a screen must be installed at the exhaust end of the tube. Vent terminal design shall not incorporate backdraft flap.

FIGURE 22: Tube Termination

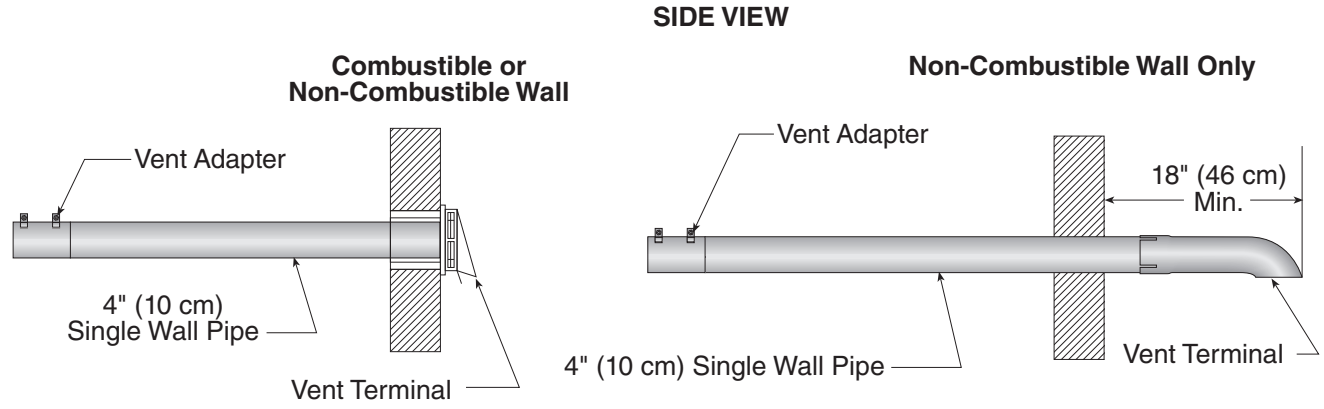


8.6 Length Requirements

The maximum vent length allowed is 45' (13.7 m).
The maximum outside air supply duct length allowed is 45' (13.7 m).
The total vent length, plus outside air duct length, plus any extensions to minimum heat exchanger lengths, cannot exceed 65' (19.8 m).

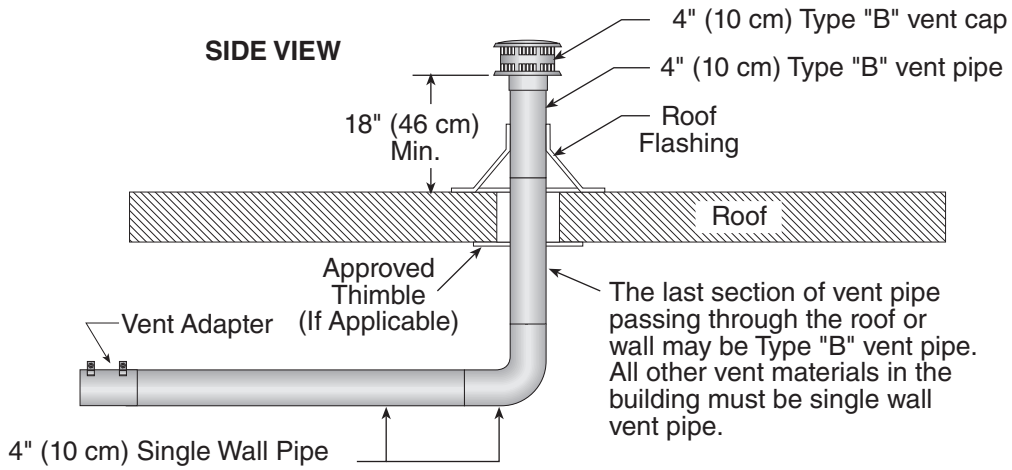
Vent length should be limited to less than 20' (6 m). If using vent lengths greater than 20' (6 m), condensation will form in the vent pipe. Insulation and additional sealing measures (high temperature silicone at all seams) are required. Optional heat exchanger beyond minimum lengths is considered as vent length for length determination.
Subtract 15' (4.6 m) of maximum allowed vent or duct length per vent elbow if more than two are used.

8.7 Horizontal Ventilation 4'' (10 cm) Pipe



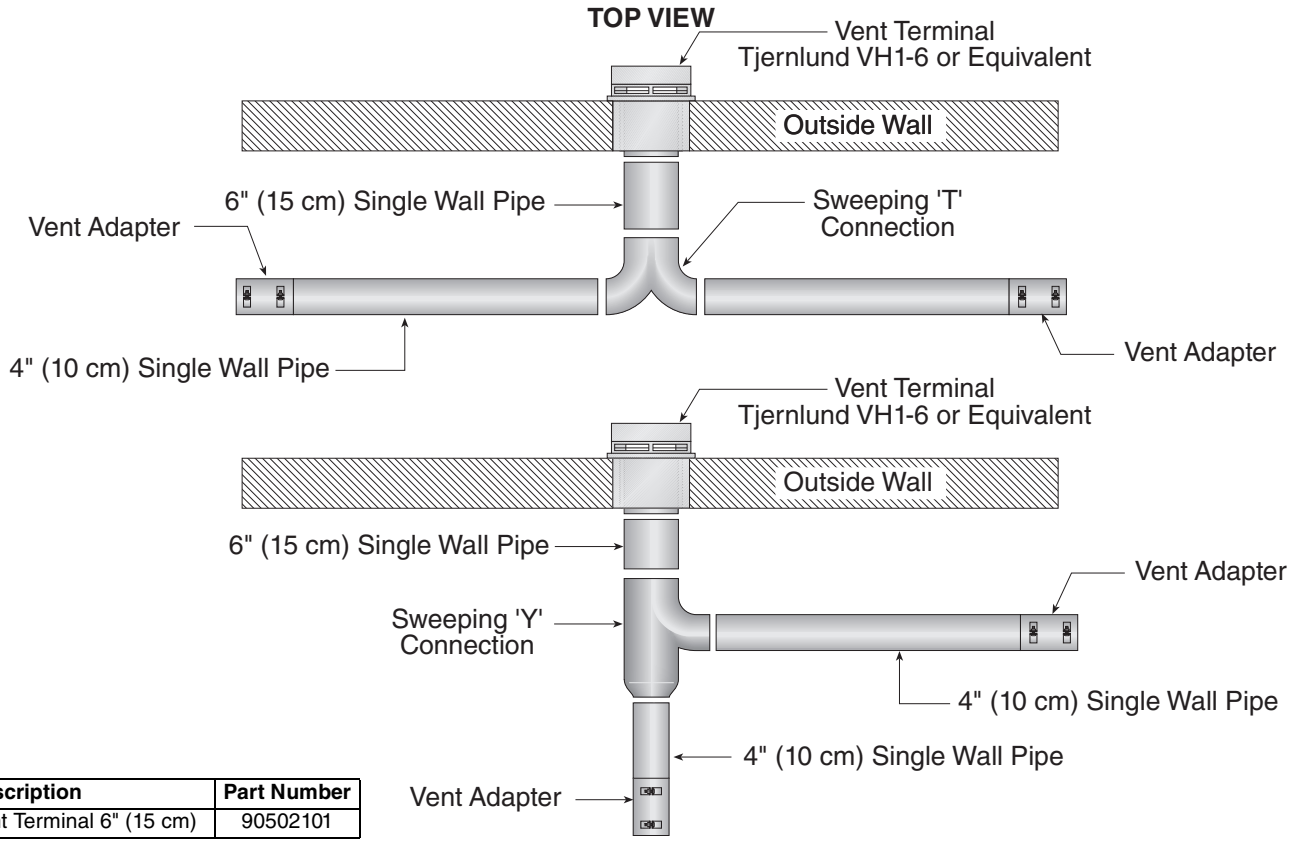
Description	Part Number
Vent Terminal (Comb. Wall)	90502100
Vent Terminal	02537801-XX
Wall Thimble 4" (10 cm)	90505600

8.8 Vertical Ventilation 4'' (10 cm) Pipe


SIDE VIEW
4" (10 cm) Type "B" vent cap
4" (10 cm) Type "B" vent pipe
Roof
Flashing
18" (46 cm)
Min.
Roof
Approved
Thimble
(If Applicable)
Vent Adapter
The last section of vent pipe passing through the roof or wall may be Type "B" vent pipe. All other vent materials in the building must be single wall vent pipe.
4" (10 cm) Single Wall Pipe

Description	Part Number
Vent Cap 4" (10 cm)	90502300

8.9 Common Side Wall Venting

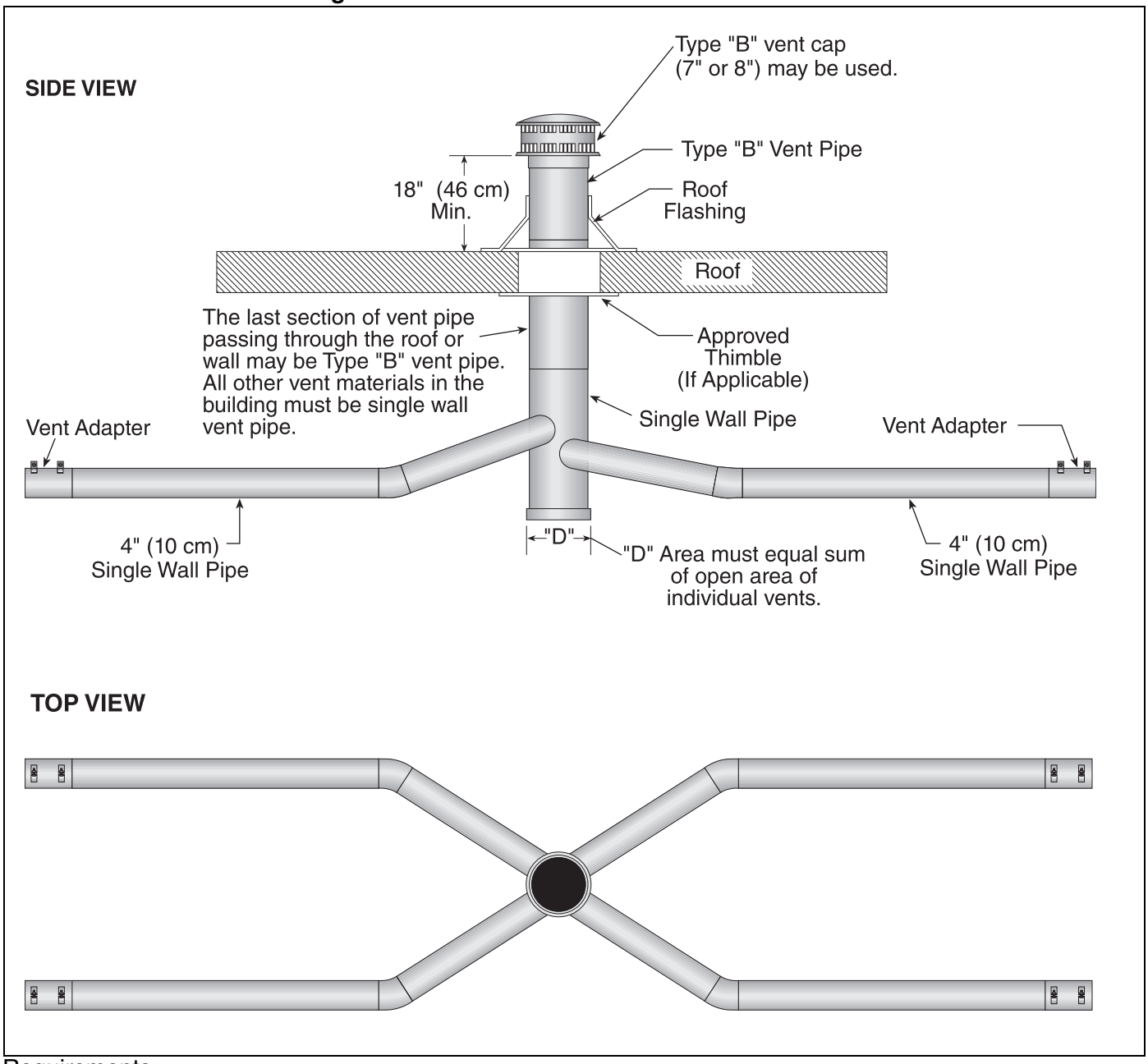


Description	Part Number
Vent Terminal 6" (15 cm)	90502101

Requirements:

- Maximum of two heaters can be commonly vented through a side wall.
- Heaters must be of the same BTU output.
- Heaters must be controlled by a common thermostat.

8.10 Common Vertical Venting



Requirements:

- Maximum of four heaters can be commonly vented through the roof.
- Heaters must be of the same BTU output.
- Heaters must be controlled by a common thermostat.
- Connections to a common stack must be positioned to avoid direct opposition between streams of combustion gases.

8.11 Outside Combustion Air Supply

IMPORTANT: If the building has a slight negative pressure or corrosive contaminants, such as halogenated hydrocarbons, are present in the air, an outside combustion air supply to the heater is required. Seal all combustion air pipe joints.

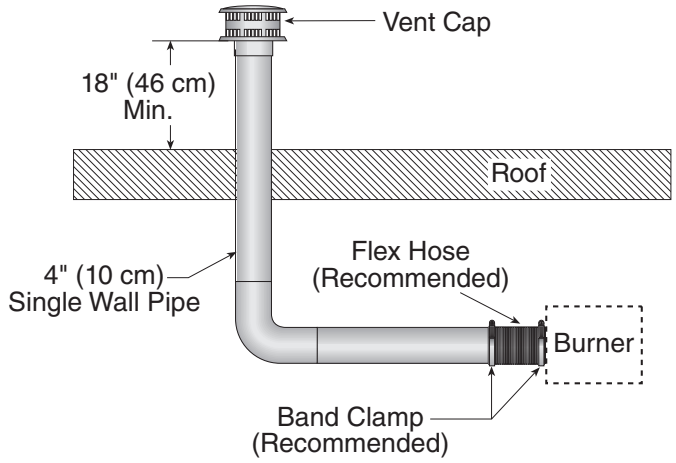
Use of optional outside combustion air is not recommended with unvented heaters.

The air supply duct may have to be insulated to prevent condensation on the outer surface. The outside air terminal must not be more than 1' (31 cm) above the vent terminal.

8.11.1 Length Requirements

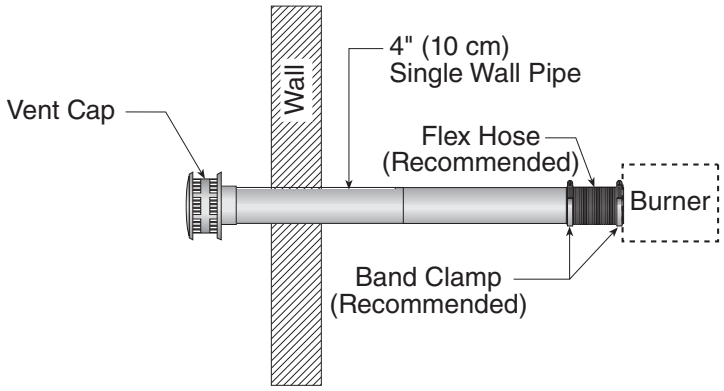
Follow the constraints listed *on Page 35, Section 8.6*.

8.11.2 Vertical Outside Air Supply for Single Heater Installation



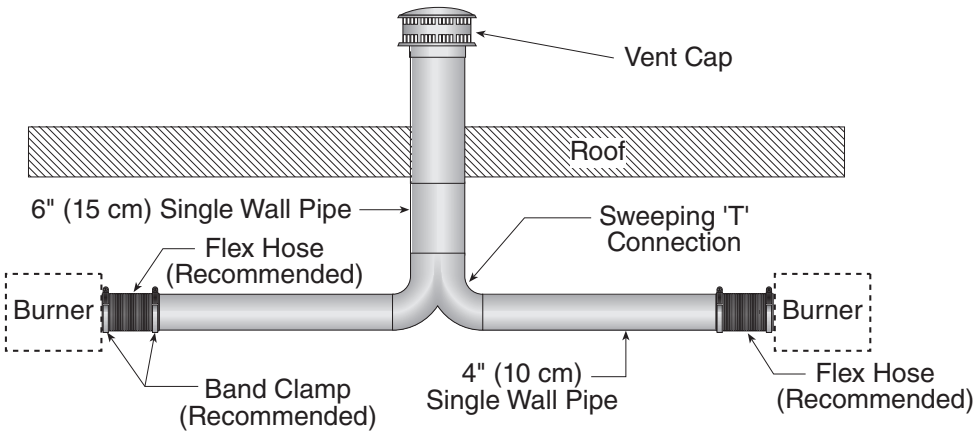
Description	Part Number
Vent Cap 4" (10 cm)	90502300

8.11.3 Horizontal Outside Air Supply for Single Heater Installation



Description	Part Number
Vent Cap 4" (10 cm)	90502300

8.11.4 Vertical Outside Air Supply for Double Heater Installation

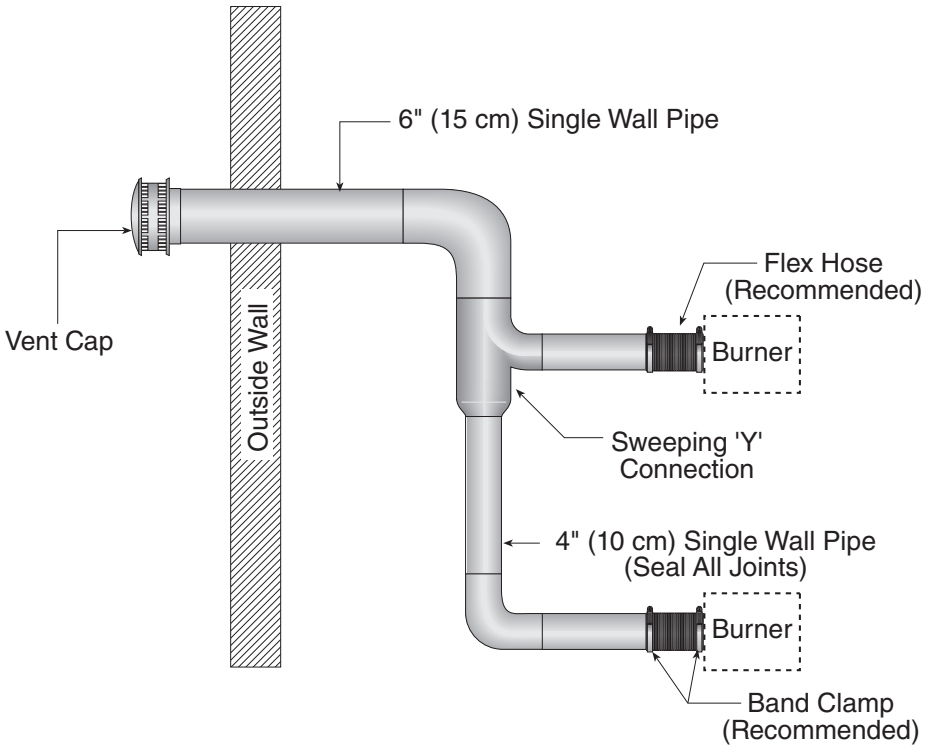


Description	Part Number
Vent Cap 6" (15 cm)	90502302

Requirements:

- Heaters must be controlled by a common thermostat.

8.11.5 Horizontal Outside Air Supply for Double Heater Installation



Description	Part Number
Vent Cap 6" (15 cm)	90502302

Requirements:

- Heaters must be controlled by a common thermostat.

SECTION 9: GAS PIPING

⚠ WARNING

Fire Hazard

Tighten gas hose fittings to connect gas supply according to Figure 23.

Gas hose can crack when twisted.

Gas hose moves during normal operation.

Use only 36" (91 cm) long connector of 1/2" or 3/4" nominal ID.

Connector supplied with heater for U.S. models (not with Canadian models).

Failure to follow these instructions can result in death, injury or property damage.

⚠ WARNING

Explosion Hazard

Leak test all components of gas piping before operation.

Gas can leak if piping is not installed properly.

Do not high pressure test gas piping with equipment connected.

Failure to follow these instructions can result in death, injury or property damage.

Install the gas hose as shown *on Page 42, Figure 23*. The gas hose accommodates expansion of the heating system and allows for easy installation and service of the burner. Before connecting the burners to the supply system, verify that all high pressure testing of the gas piping has been completed. There is an expansion of the tube with each firing cycle; this will cause the burner to move with respect to the gas hose. This can cause a gas leak resulting in an unsafe condition if the gas connection is not made strictly in accordance with *Figure 23 on Page 42*.

Meter and service must be large enough to handle all the burners being installed plus any other connected load. The gas hose which feeds the system must be large enough to supply the required gas with a maximum pressure drop of 1/2" w.c. When gas piping is not included in the layout drawing, the local gas supplier will usually help in planning the gas piping.

Gas lines must meet applicable codes:
United States: The Flexible Stainless Steel Gas Hose (US models) supplied with the heater is certified per the Standard for Connectors for Gas Appliances, ANSI Z21.24/CSA 6.10 - latest revision.
Canada: The Rubber Type 1 Gas Hose (Canadian models) optional with the heater is certified as being in compliance with the Standard for Elastomeric Composite Hose and Hose Couplings for Conducting Propane and Natural Gas, CAN/CGA 8.1 - Latest revision.

- **Check the pipe and tubing ends for leaks before placing heating equipment into service. When checking for gas leaks, use a soap and water solution; never use an open flame.**

FIGURE 23: Gas Connection with Flexible Gas Hose

CORRECT POSITIONS

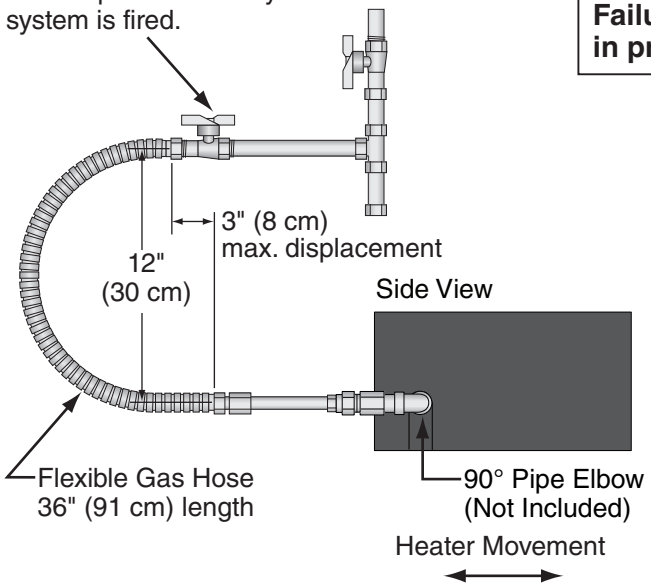
⚠ CAUTION

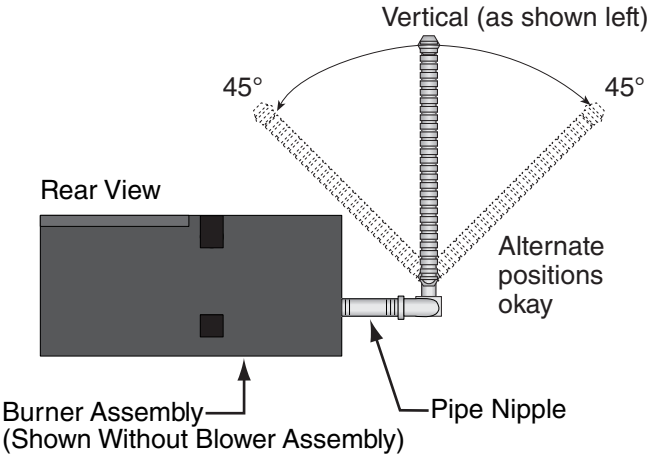
Product Damage Hazard

Hold gas nipple securely with pipe wrench when attaching gas hose.

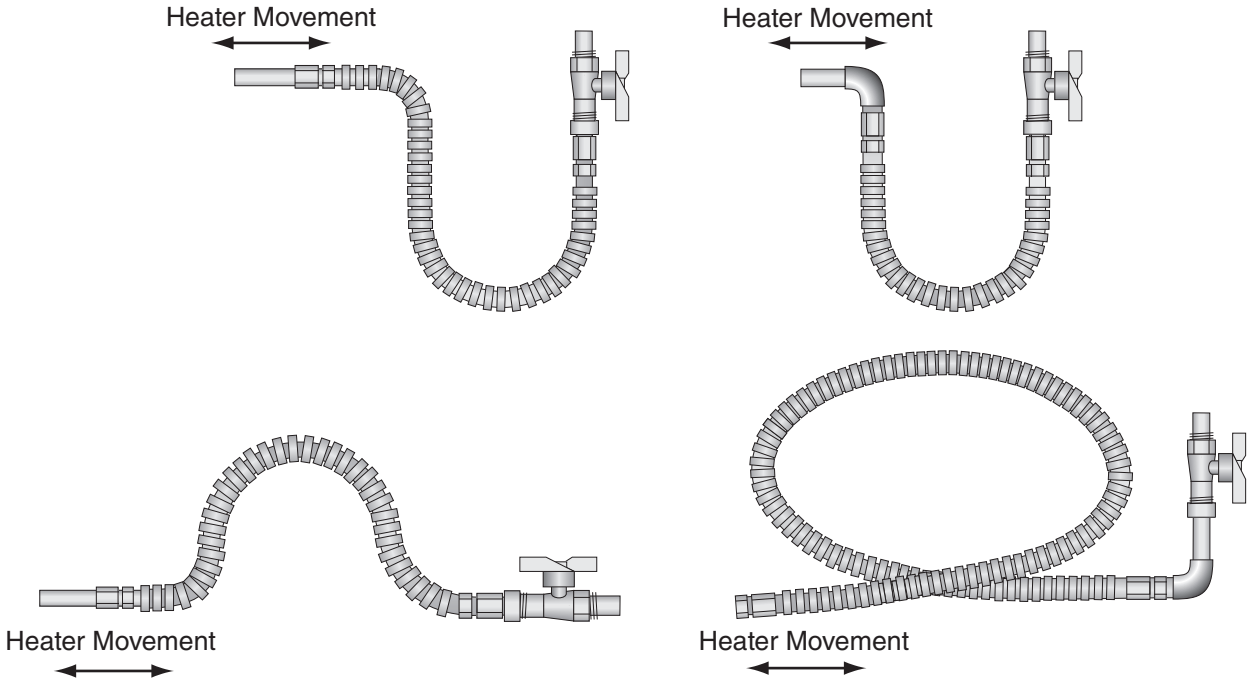
Failure to follow these instructions can result in product damage.

Shut-Off Valve (included with gas hose) must be parallel to burner gas inlet. The 3" (8 cm) displacement shown is for the cold condition. This displacement may reduce when the system is fired.





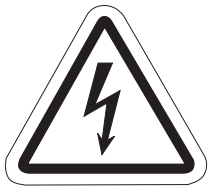
INCORRECT POSITIONS (WRONG INSTALLATION)



Description	Part Number
1/2" Flexible Stainless Steel Gas Hose (US Models)	91412200
3/4" Flexible Stainless Steel Gas Hose (US Models)	91412204
1/2" Rubber Type 1 Gas Hose (Canadian Models)	91412206
3/4" Rubber Type 1 Gas Hose (Canadian Models)	91412207

SECTION 10: WIRING

⚠ DANGER



Electrical Shock Hazard

Disconnect electric before service.

Heater must be properly grounded to an electrical source.

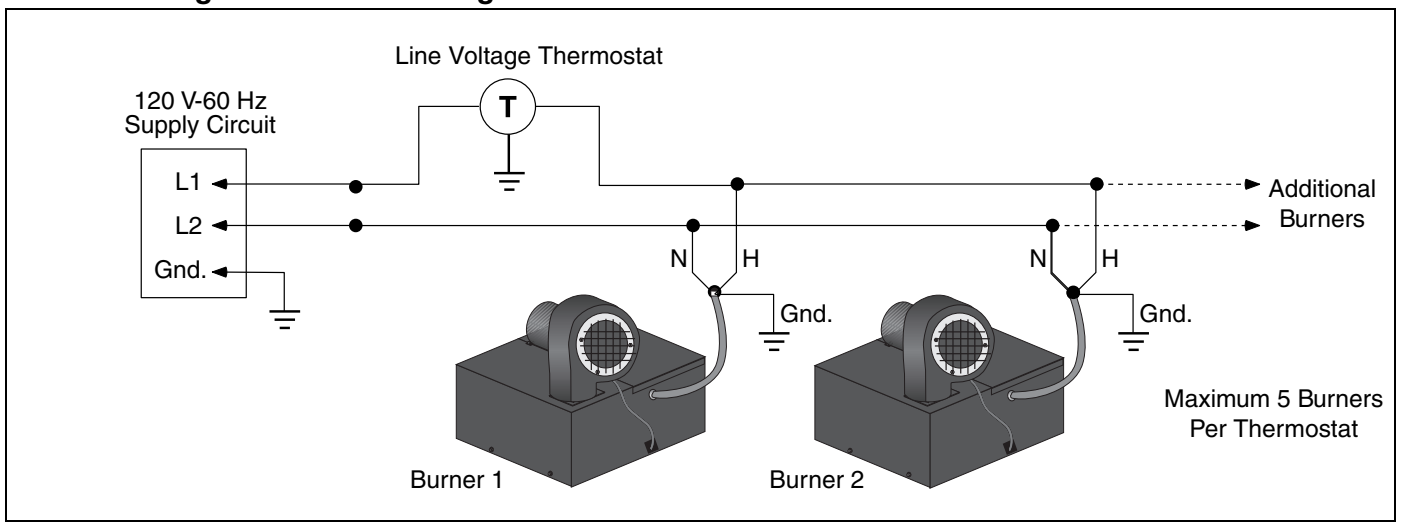
Failure to follow these instructions can result in death or electrical shock.

Heaters can be controlled using several methods. Normally thermostats are used to control the heaters but they can also be controlled by an energy management system. *Section 10.1* illustrates the connection for heaters controlled by a line voltage thermostat.

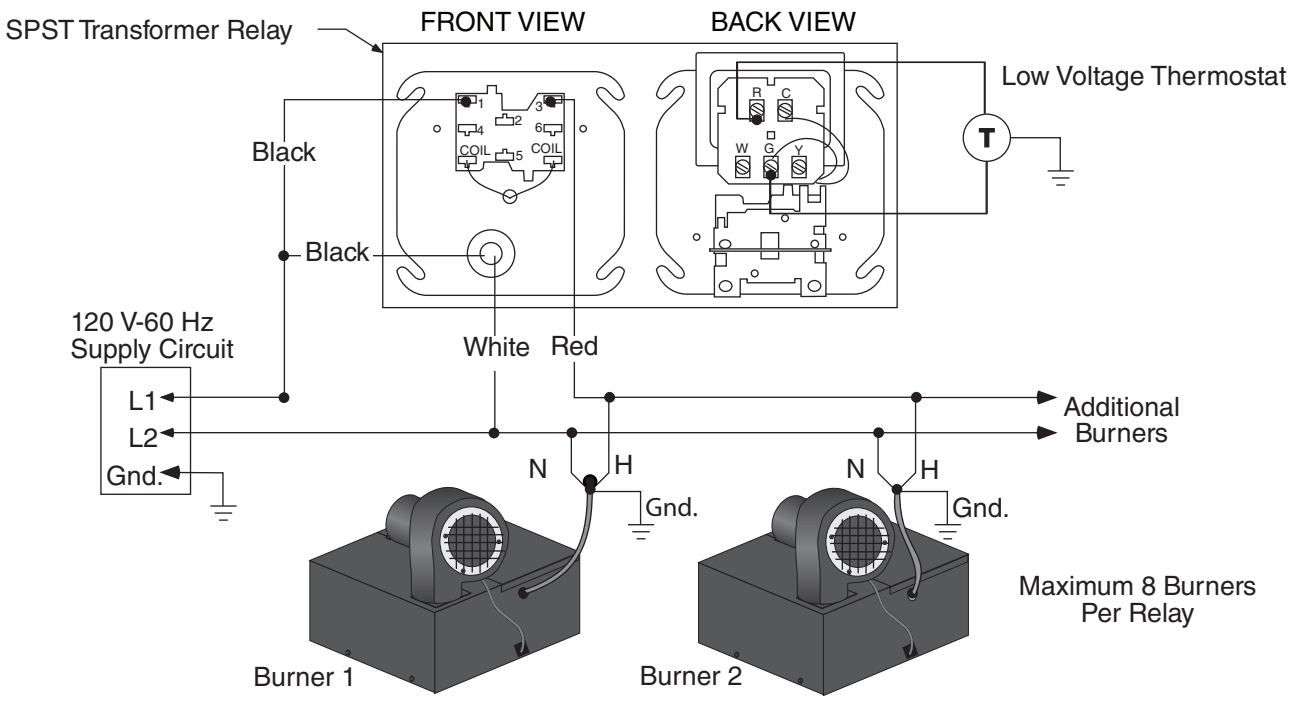
For heaters on a low voltage thermostat, *See Page 44, Section 10.2*. Heaters must be grounded in accordance with applicable codes: United States: Refer to National Electrical Code® NFPA 70 - latest revision; Canada: Refer to Canadian Electrical Code CSA C22.1 Part I - latest revision.

If any of the original internal wiring must be replaced, it must be replaced with wiring materials having a temperature rating of at least 105°C and 600 volts.

10.1 Line Voltage Thermostat Wiring

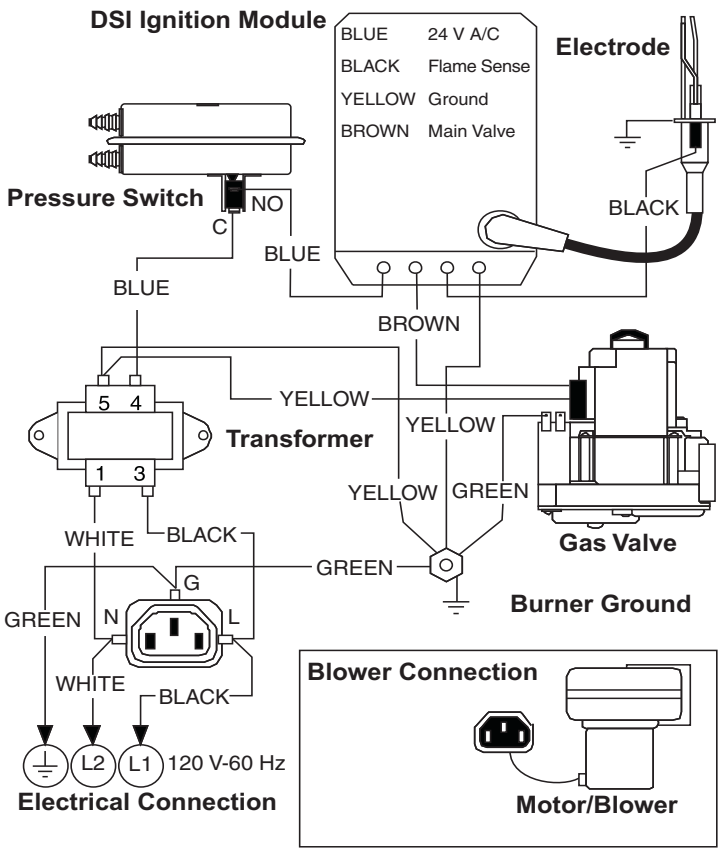


10.2 Low Voltage Thermostat Wiring

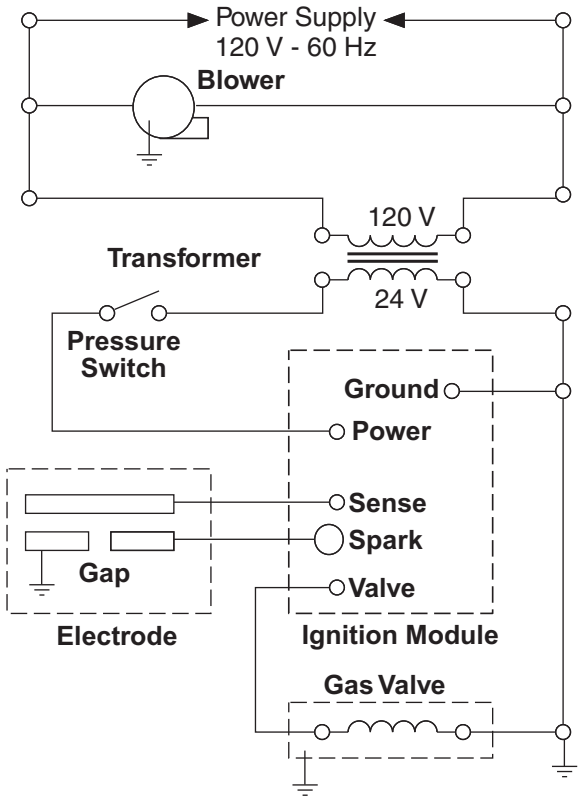


Description	Part Number
SPST Transformer Relay	90417600K
Low Voltage Thermostat	90425100

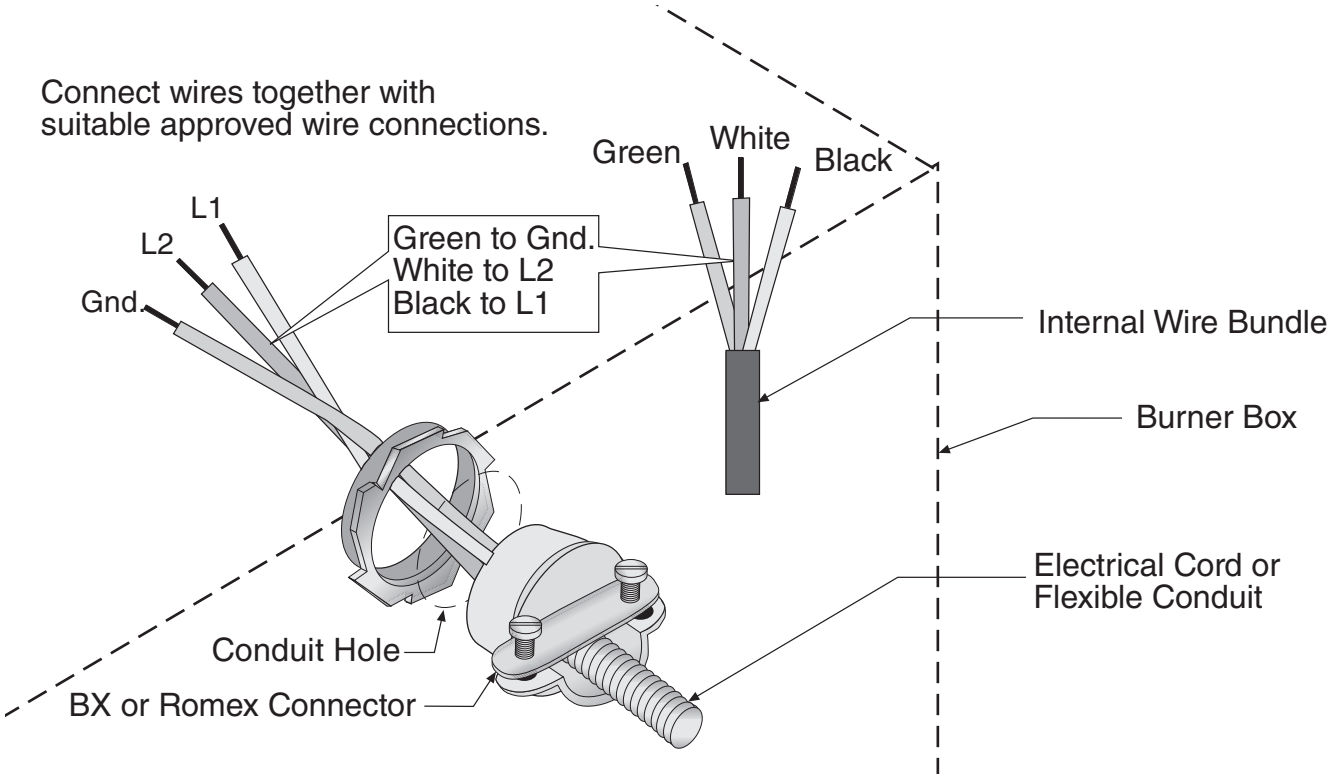
10.3 Internal Wiring



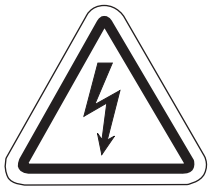
10.4 Ladder Diagram



10.5 Electrical Connection to the Burner



SECTION 11: OPERATION AND MAINTENANCE

⚠ DANGER	⚠ WARNING		
			
Electrical Shock Hazard **Disconnect electric before service.** **More than one disconnect switch may be required to disconnect electric from heater.** **Heater must be connected to a properly grounded electrical source.**	**Explosion Hazard** **Turn off gas supply to heater before service.**	**Burn Hazard** **Allow heater to cool before service.** **Tubing may still be hot after operation.**	**Cut/Pinch Hazard** **Wear protective gear during installation, operation and service.** **Edges are sharp.**
Failure to follow these instructions can result in death, electric shock, injury or property damage.			

This heater is equipped with a direct spark ignition system.

11.1 Sequence of Operation

1. Turn the thermostat up. When the thermostat calls for heat, the blower motor will energize.
2. When the motor approaches nominal running RPM, the pressure switch closes and activates the ignition module.
3. After a 45 second prepurge, the ignition module then opens the gas valve and energizes the spark igniter.
4. When the flame is established, the sparking sequence ceases.
5. If the flame is not established during the ignition sequence, the ignition module closes the gas valve and purge begins. Module will try 2 additional times for ignition (with purges in between trials). If ignition is not established, the module will lockout.
6. If the flame extinguishes during operation, the ignition module will attempt the multiple trial sequence described in step 5. If ignition is not re-established, the module will lockout for one hour or until reset.
7. After lockout, the control can be reset by turning down thermostat for five seconds, and then raising it again to desired temperature, or by disconnecting power and then reconnecting.
8. When thermostat is satisfied, all power to the unit is shut off.

11.2 To Shut Off Heater

Set thermostat to lowest setting.
Turn OFF electric power to heater.
Turn OFF manual gas valve in the heater supply line.

11.3 To Start Heater

Turn gas valve and electric power OFF and wait five minutes for unburned gases to vent from heater.
Turn ON main gas valve.
Turn ON electric power.
Set thermostat to desired temperature.
Burner should light automatically.

11.4 Pre-Season Maintenance and Annual Inspection

To ensure your safety and years of trouble-free operation of the heating system, service and annual inspections must be done by a contractor qualified in

the installation and service of gas-fired heating equipment.

Turn off gas and electric supplies before performing service or maintenance. Allow heater to cool before servicing.

Before every heating season, a contractor qualified in the installation and service of gas-fired heating equipment must perform a thorough safety inspection of the heater.

For best performance, the gas, electrical, thermostat connections, tubing, venting, suspensions and overall heater condition should be inspected thoroughly.

NOTE: Gas flow and burner ignition are among the first things that should be inspected.

Please *see Page 49, Section 11.5* for suggested items to inspect.

11.5 Maintenance Checklist

Installation Code and Annual Inspections:
All installation and service of BANANZA® equipment must be performed by a contractor qualified in the installation and service of equipment sold and supplied by Bananza and conform to all requirements set forth in the BANANZA® manuals and all applicable governmental authorities pertaining to the installation, service and operation of the equipment.

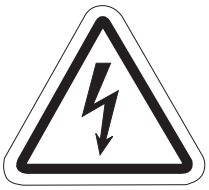
To help facilitate optimum performance and safety, Bananza recommends that a qualified contractor conduct, at a minimum, annual inspections of your BANANZA® equipment and perform service where necessary, using only replacement parts sold and supplied by Bananza.

The Vicinity of the Heater	Do not store or use flammable objects, liquids or vapors near the heater. Immediately remove these items if they are present. *See Page 4, Section 3*.
Vehicles and Other Objects	Maintain the clearances to combustibles. Do not hang anything from, or place anything on, the heater. Make sure nothing is lodged underneath the reflector, in between the tubes or in the decorative or protective grilles (included with select models). Immediately remove objects in violation of the clearances to combustibles. *See Page 4, Section 3*.
Reflector	Support reflector with reflector hanger and support strap. Reflector must not touch tube. Make sure there is no dirt, sagging, cracking or distortion. Do not operate if there is sagging, cracking or distortion. Make sure reflectors are correctly overlapped. *See Page 22, Section 6.5.1*. Clean outside surface with a damp cloth.
Vent Pipe	Venting must be intact. Using a flashlight, look for obstructions, cracks on the pipe, gaps in the sealed areas or corrosion. The area must be free of dirt and dust. Remove any carbon deposits or scale using a wire brush. *See Page 34, Section 8*.
Outside Air Inlet	Inlet must be intact. Look for obstructions, cracks on the pipe, gaps in the sealed areas or corrosion. The area must be free of dirt and dust. Clean and reinstall as required.
Tubes	Make sure there are no cracks. Make sure tubes are connected and suspended securely. *See Page 13, Section 6*. Make sure there is no sagging, bending or distortion. Clean or replace as required.
Gas Line	Check for gas leaks. *See Page 41, Section 9*.
Burner Observation Window	Make sure it is clean and free of cracks or holes. Clean and replace as required.
Blower Scroll, Wheel and Motor	Compressed air or a vacuum cleaner may be used to clean dust and dirt.
Burner Cup and Orifice	Clear of obstructions (even spider webs will cause problems). Carefully remove any dust and debris from the burner.

Electrode	Replace if there are cracked ceramics, excessive carbon residue, or erosion of the electrode. The electrode gap should be 1/8" (3.2 mm).
Thermostat	There should be no exposed wire or damage to the thermostat. *See Page 43, Section 10*.
Suspension Points	Make sure the heater is hanging securely. Look for signs of wear on the chain or ceiling. *See Page 14, Figure 14*.
Decorative and Protective Grille (optional)	The grille must be securely attached. Check that the side reflector extensions are installed correctly and secured in place if necessary. (Decorative grille only.) *See Page 31, Section 7.5 and Page 33, Section 7.6* Make sure shield is installed correctly and secured in place if necessary. (Decorative grille only.) *See Page 32, Section 7.5.2*.
Lower Clearance Shield (optional)	The lower shield must be securely attached. Inspect shield support straps and lower clearance shield anchor points. *See Page 31, Section 7.4*. Make sure shield is installed correctly and secured in place if necessary. *See Page 31, Section 7.4*.
Wall Tag	If wall tag is present, make sure it is legible and accurate. Please contact Bananza or your BANANZA® independent distributor, if you need a wall tag. *See Page 3, Section 2.1*

SECTION 12: TROUBLESHOOTING

⚠ DANGER



Electrical Shock Hazard

Disconnect electric before service.

Heater must be properly grounded to an electrical source.

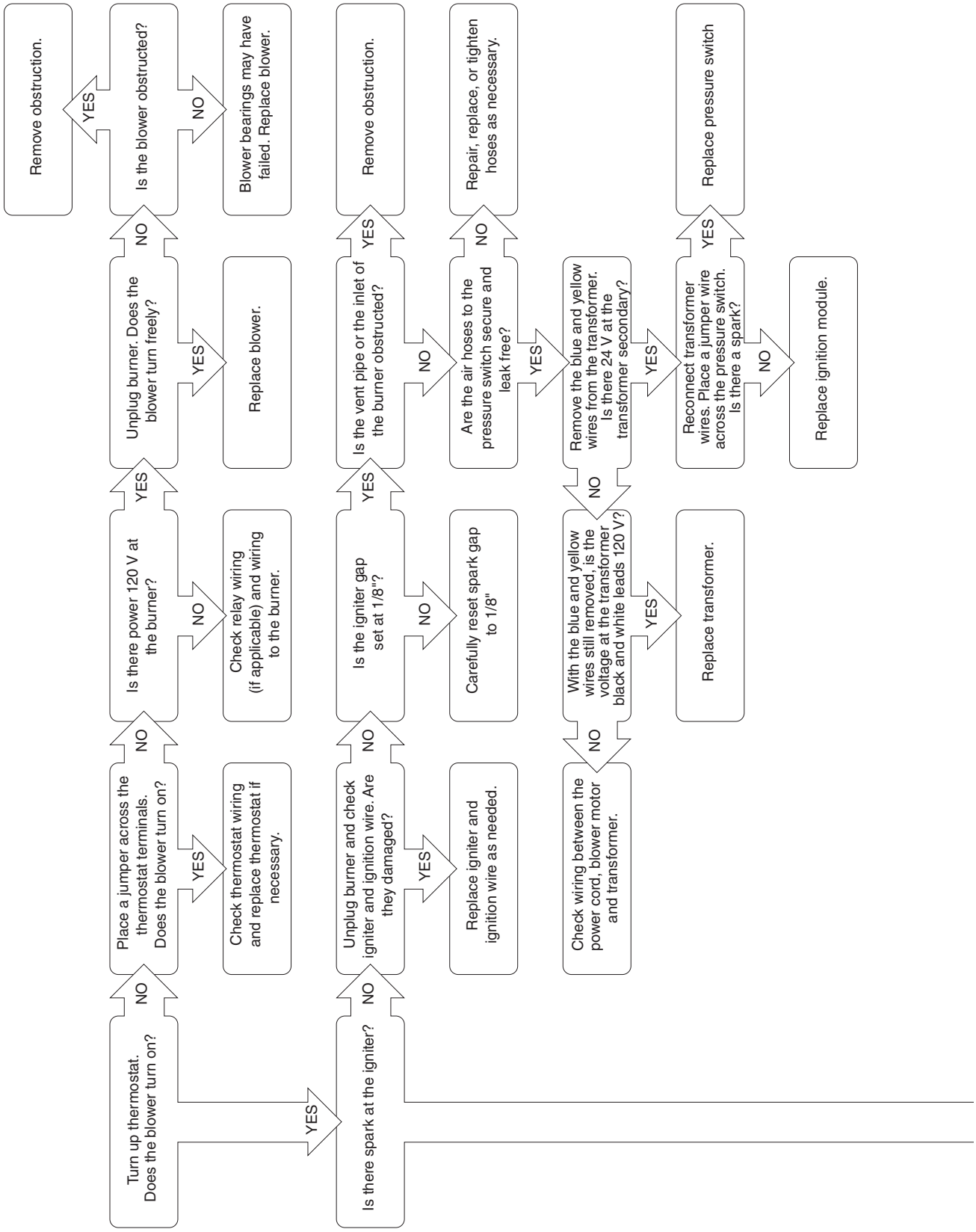
Failure to follow these instructions can result in death or electrical shock.

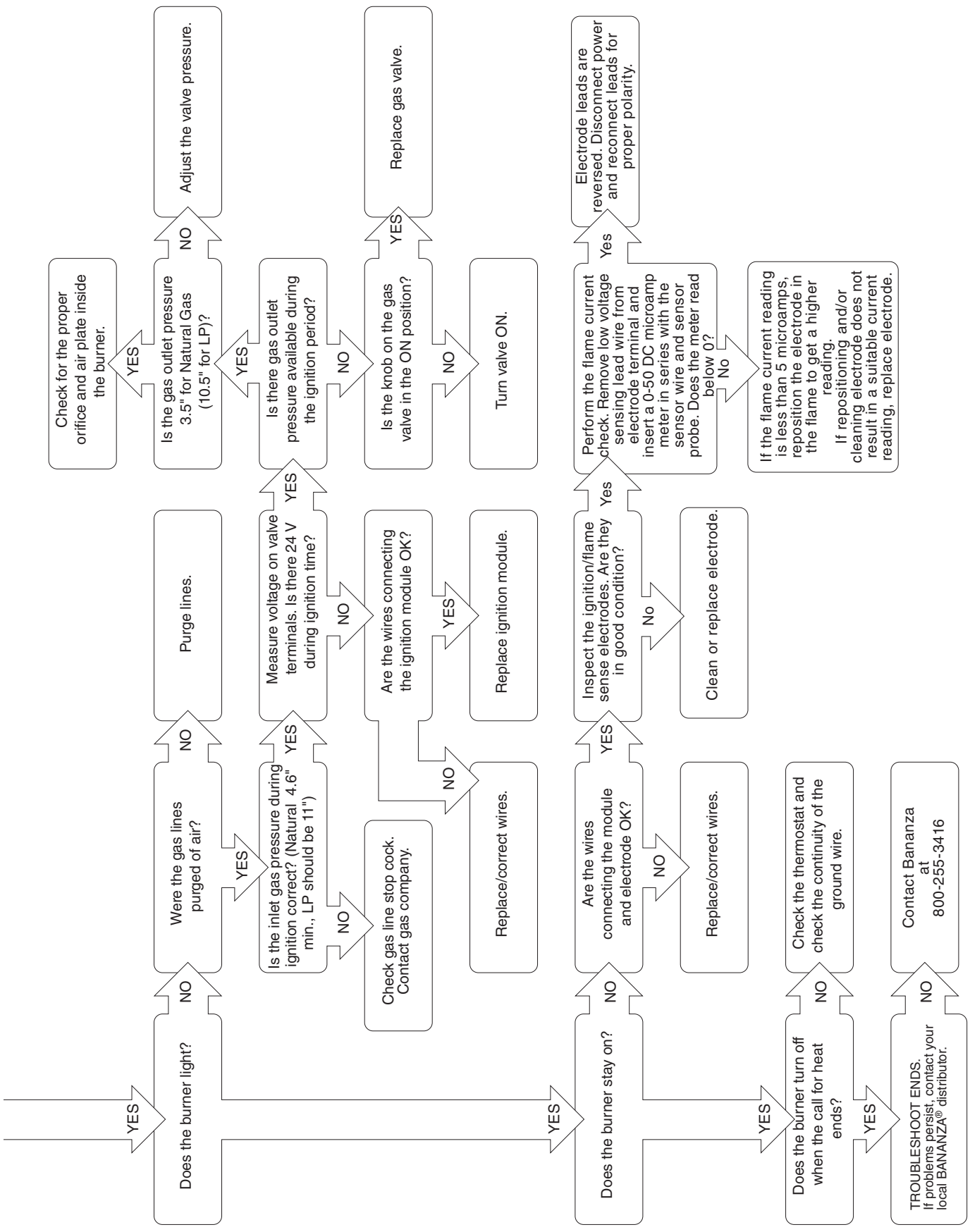
⚠ WARNING

Fire Hazard	**Explosion Hazard**	**Burn Hazard**	**Cut/Pinch Hazard**
Keep all flammable objects, liquids and vapors the minimum required clearances to combustibles away from heater. **Some objects will catch fire or explode when placed close to heater.**	**Turn off gas supply to heater before service.**	**Allow heater to cool before service.** **Tubing may still be hot after operation.**	**Wear protective gear during installation, operation and service.** **Edges are sharp.**

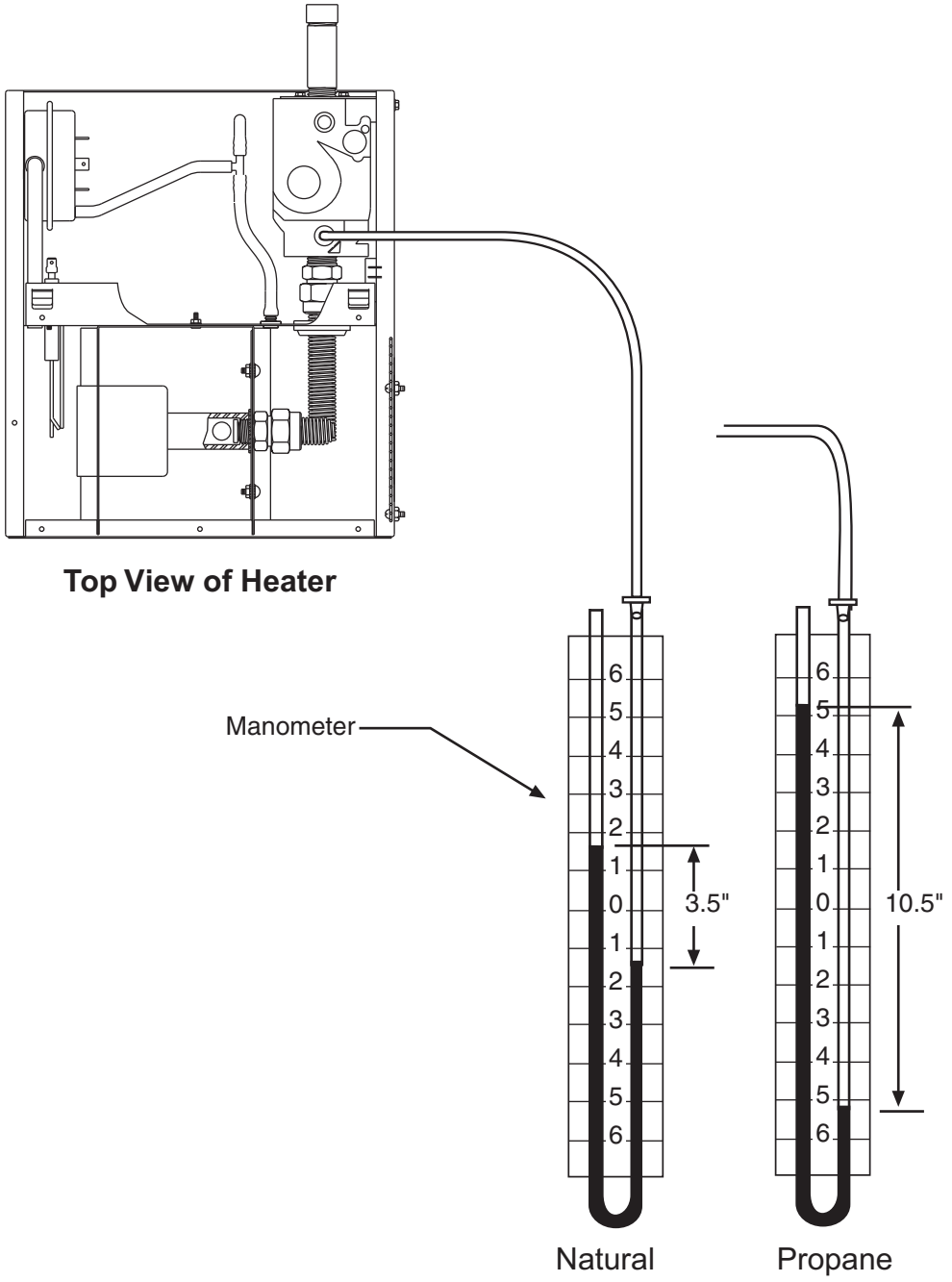
Failure to follow these instructions can result in death, injury or property damage.

12.1 Troubleshooting Flow Chart


Turn up thermostat. Does the blower turn on?
NO
Place a jumper across the thermostat terminals. Does the blower turn on?
NO
Is there power 120 V at the burner?
NO
Check relay wiring (if applicable) and wiring to the burner.
YES
Unplug burner. Does the blower turn freely?
NO
Is the blower obstructed?
YES
Remove obstruction.
NO
Blower bearings may have failed. Replace blower.
YES
Replace blower.
YES
Check thermostat wiring and replace thermostat if necessary.
YES
Is there spark at the igniter?
NO
Unplug burner and check igniter and ignition wire. Are they damaged?
NO
Is the igniter gap set at 1/8"?
NO
Carefully reset spark gap to 1/8"
YES
Is the vent pipe or the inlet of the burner obstructed?
YES
Remove obstruction.
NO
Are the air hoses to the pressure switch secure and leak free?
NO
Repair, replace, or tighten hoses as necessary.
YES
Replace igniter and ignition wire as needed.
YES
Check wiring between the power cord, blower motor and transformer.
NO
With the blue and yellow wires still removed, is the voltage at the transformer black and white leads 120 V?
NO
Remove the blue and yellow wires from the transformer. Is there 24 V at the transformer secondary?
YES
Replace transformer.
YES
Reconnect transformer wires. Place a jumper wire across the pressure switch. Is there a spark?
YES
Replace pressure switch
NO
Replace ignition module.


Does the burner light?
YES
NO
Were the gas lines purged of air?
YES
NO
Purge lines.
Is the inlet gas pressure during ignition correct? (Natural 4.6" min., LP should be 11")
YES
NO
Check gas line stop cock. Contact gas company.
Measure voltage on valve terminals. Is there 24 V during ignition time?
YES
NO
Are the wires connecting the ignition module OK?
YES
NO
Replace ignition module.
Replace/correct wires.
Does the burner stay on?
YES
NO
Are the wires connecting the module and electrode OK?
YES
NO
Replace/correct wires.
Inspect the ignition/flame sense electrodes. Are they in good condition?
Yes
No
Clean or replace electrode.
Perform the flame current check. Remove low voltage sensing lead wire from electrode terminal and insert a 0-50 DC microamp meter in series with the sensor wire and sensor probe. Does the meter read below 0?
Yes
No
Electrode leads are reversed. Disconnect power and reconnect leads for proper polarity.
If the flame current reading is less than 5 microamps, reposition the electrode in the flame to get a higher reading.
If repositioning and/or cleaning electrode does not result in a suitable current reading, replace electrode.
Does the burner turn off when the call for heat ends?
YES
NO
Check the thermostat and check the continuity of the ground wire.
TROUBLESHOOT ENDS.
If problems persist, contact your local BANANZA® distributor.
YES
NO
Contact Bananza at 800-255-3416
Check for the proper orifice and air plate inside the burner.
YES
Is the gas outlet pressure 3.5" for Natural Gas (10.5" for LP)?
YES
NO
Adjust the valve pressure.
Is there gas outlet pressure available during the ignition period?
YES
NO
Is the knob on the gas valve in the ON position?
YES
NO
Replace gas valve.
Turn valve ON.

12.2 Manifold Gas Pressure Setting

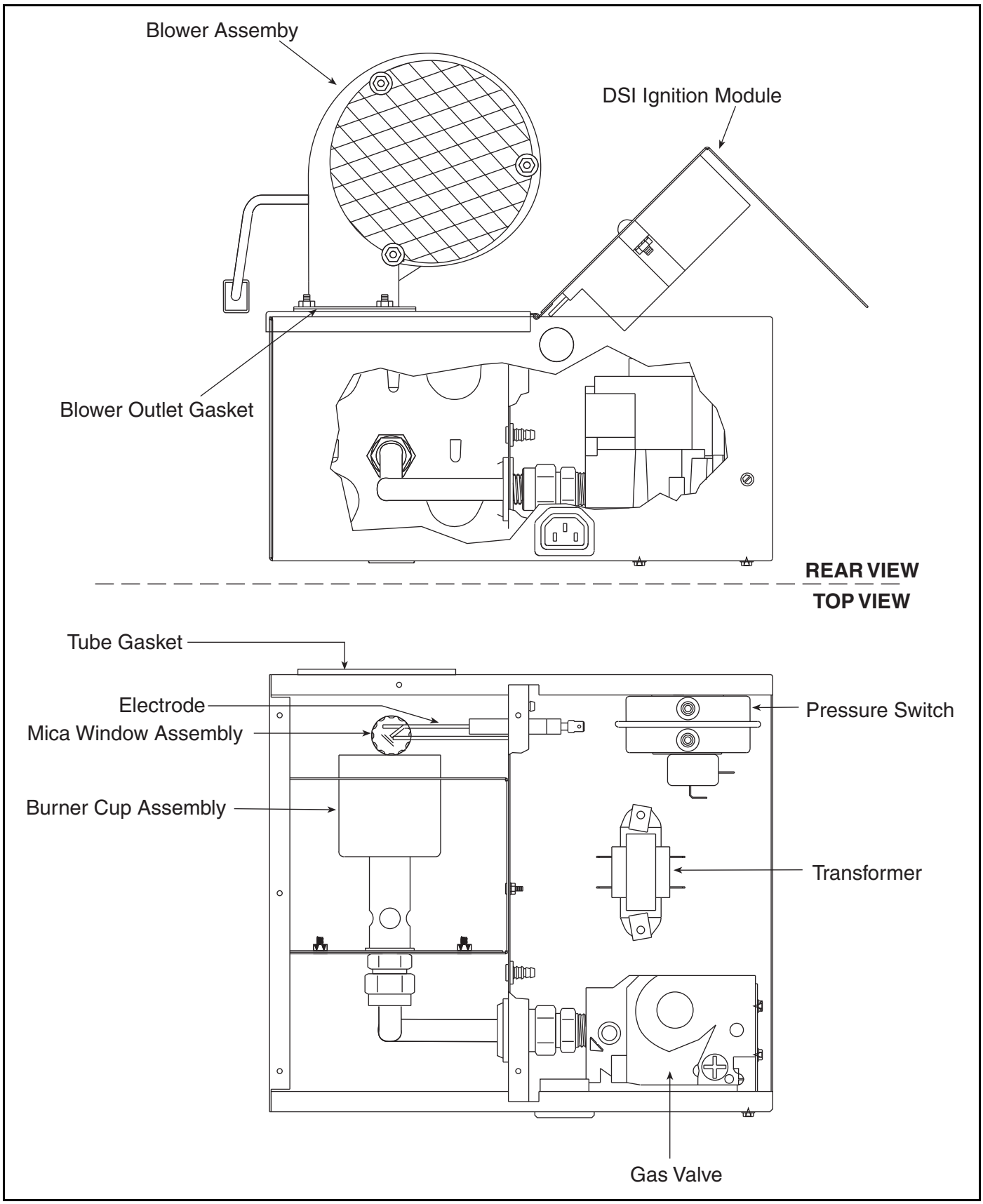


SECTION 13: REPLACEMENT PARTS

⚠ DANGER	⚠ WARNING		
Electrical Shock Hazard	**Explosion Hazard**	**Fire Hazard**	**Carbon Monoxide Hazard**

Use only genuine BANANZA® replacement parts per this installation, operation and service manual.

Failure to follow these instructions can result in death, electric shock, injury or property damage.


Blower Assemby
DSI Ignition Module
Blower Outlet Gasket
REAR VIEW
TOP VIEW
Tube Gasket
Electrode
Mica Window Assembly
Burner Cup Assembly
Pressure Switch
Transformer
Gas Valve

Description	Part Number
Mica Window Assembly	02553203
Electrode Gasket	02558501
Tube Gasket	02568200
Burner Cup Assembly	03020100
Gas Valve (Natural)	90032500
Gas Valve (LP)	90032502
Electrode	90427400
DSI Ignition Module	90439500K
Transformer	90436900K
Pressure Switch	
(200)	90439801K
(115, 140, 175)	90439802K
(150)	90439803K
(60, 80, 100, 125)	90439805K
(40)	90439808K
Motor/Blower Assembly	90709700-P
Blower Outlet Gasket	90709801

SECTION 14: GENERAL SPECIFICATIONS

14.1 Material Specifications

14.1.1 Reflectors

.024 Aluminum
(Optional .024 Stainless Steel Type 304)

14.2 Heater Specifications

14.2.1 Ignition

Fully automatic, three-try, direct spark, electronic ignition control, 100% safety shut-off.

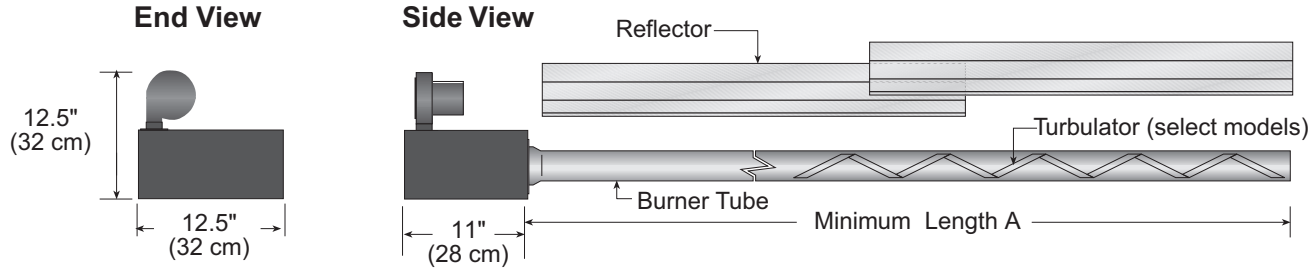
14.3 Suspension Specifications

Hang heater with materials with a minimum working load of 75 lbs (33 kg). *See Page 14, Figure 14*.

14.4 Controls Specifications

Time switches, thermostats, etc. can be wired into the electrical supply. External controls supplied as an optional extra.

General Specifications for BH-Series heaters are as follows:



Model	Heat Input Rate (Btu/h) x (1000)	Length "A" Minimum	Recommended Minimum Mounting Height* Space	Spot
BH-40	40	10' (3 m)	8-10' (2.4 - 3 m)	8'(2.4 m)
BH-60	60	20' (6 m)	10-12' (3 - 3.6 m)	9' (2.7 m)
BH-80	80	20' (6 m)	12-15' (3.6 - 4.5 m)	11' (3.3 m)
BH-100	100	30' (9 m)	12-15' (3.6 - 4.5 m)	12' (3.7 m)
BH-115	115	30' (9 m)	15-20' (4.5 - 6 m)	15' (4.6 m)
BH-125	125	40' (12 m)	15-20' (4.5 - 6 m)	15' (4.6 m)
BH-140	140	40' (12 m)	20-25' (6 - 7.6 m)	20' (6.1 m)
BH-150	150	50' (15 m)	20-25' (6 - 7.6 m)	20' (6.1 m)
BH-175	175	50' (15 m)	25' (7.6 m)	23' (7 m)
BH-200	200	60' (18 m)	25' (7.6 m)	25' (7.6 m)

**See Page 4, Section 3* for clearances to combustibles.

GAS PRESSURE AT MANIFOLD:

Natural Gas: 3.5" wc
LP Gas: 10.5" wc

PIPE CONNECTION:

1/2" NPT (for BH-40, 60, 80, 100, 115 & 125)
3/4" NPT (for BH- 140, 150,175 & 200)

DIMENSIONS:

Vent Connection Size: 4" (10 cm)
Outside Air Connection Size: 4" (10 cm)
Refer to figure above for dimensional information.

GAS INLET PRESSURE:

Natural Gas:

for BH-40, 60, 80, 100, 115, 125, 140, 150: 4.6" wc Minimum
for BH-175, 200: 5.0" wc Minimum
14.0" wc Maximum

LP Gas: 11.0" wc Minimum
14.0" wc Maximum

ELECTRICAL RATING (ALL MODELS):

120 V - 60 Hz, 1 A

SECTION 15: THE BANANZA® BH WARRANTY

BANANZA WILL PAY FOR:

Within 36 months from date of purchase by buyer or 42 months from date of shipment by Bananza (whichever occurs first), replacement parts will be provided free of charge for any part of the product which fails due to a manufacturing or material defect.

Bananza will require the part in question to be returned to the factory. Bananza will, at its sole discretion, repair or replace after determining the nature of the defect and disposition of part in question.

BANANZA® Replacement Parts are warranted for a period of 12 months from date of shipment from Bananza or the remaining BANANZA® BH warranty.

BANANZA WILL NOT PAY FOR:

Service trips, service calls and labor charges.

Shipment of replacement parts.

Claims where the total price of the goods have not been paid.

Damage due to:

- Improper installation, operation or maintenance.
- Misuse, abuse, neglect, or modification of the BANANZA® BH in any way.
- Use of the BANANZA® BH for other than its intended purpose.
- Incorrect gas or electrical supply, accident, fire, floods, acts of God, war, terrorism, or other casualty.
- Improper service, use of replacement parts or accessories not specified by Bananza.
- Failure to install or maintain the BANANZA® BH as directed in the Installation, Operation and Service Manual.
- Relocation of the BANANZA® BH after initial installation
- Use of the BANANZA® BH in a corrosive atmosphere containing contaminants.
- Use of the BANANZA® BH in the vicinity of a combustible or explosive material.
- Any defect in the BANANZA® BH arising from a drawing, design, or specification supplied by or on behalf of the consumer.
- Damage incurred during shipment. Claim must be filed with carrier.

WARRANTY IS VOID IF:

The BANANZA® BH is not installed by an contractor qualified in the installation and service of gas fired heating equipment.

You cannot prove original purchase date and required annual maintenance history.

The data plate and/or serial number are removed, defaced, modified or altered in any way.

The ownership of the BANANZA® BH is moved or transferred. This warranty is non-transferable.

Bananza is not permitted to inspect the damaged equipment and/or component parts.

READ YOUR INSTALLATION, OPERATION AND SERVICE MANUAL.

If you have questions about your equipment, contact your installing professional. Should you need Replacement Parts or have additional questions, call or write:

Bananza
1100 Seven Mile Road NW
Comstock Park, MI 49321
616.698.0500
On the web at: www.bananza.com

Bananza's liability, and your exclusive remedy, under this warranty or any implied warranty (including the implied warranties of merchantability and fitness for a particular purpose) is limited to providing replacement parts during the term of this warranty. Some jurisdictions do not allow limitations on how long an implied warranty lasts, so this limitation may not apply to you. There are no rights, warranties or conditions, expressed or implied, statutory or otherwise, other than those contained in this warranty.

Bananza shall in no event be responsible for incidental or consequential damages or incur liability for damages in excess of the amount paid by you for the BANANZA® BH. Some jurisdictions do not allow the exclusion or limitation of incidental or consequential damages, so this limitation or exclusion may not apply to you. This warranty gives you specific legal rights, and you may also have other rights which vary from jurisdiction to jurisdiction.

Bananza shall not be responsible for failure to perform under the terms of this warranty if caused by circumstances out of its control, including but not limited to war, fire, flood, strike, government or court orders, acts of God, terrorism, unavailability of supplies, parts or power. No person is authorized to assume for Bananza any other warranty, obligation or liability.

LIMITATIONS ON AUTHORITY OF REPRESENTATIVES:

No representative of Bananza, other than an Executive Officer, has authority to change or extend these provisions. Changes or extensions shall be binding only if confirmed in writing by Bananza's duly authorized Executive Officer.

Attach this information to a wall near the BANANZA® heater.

BANANZA

Read the Installation, Operation, and Service Manual thoroughly before installation, operation, or service.

Know your model number and installed configuration.

Model number and installed configuration are found on the burner and in the Installation, Operation and Service Manual.

Write the largest clearance dimensions with permanent ink according to your model number and configuration in the open spaces below.

OPERATING INSTRUCTIONS

1. STOP! Read all safety instructions on this information sheet.
2. Open the manual gas valve in the heater supply line.
3. Turn on electric power to the heater.
4. Set the thermostat to desired setting.

TO TURN OFF THE HEATER

1. Set the thermostat to off or the lowest setting.

IF THE HEATER WILL NOT OPERATE, TO ENSURE YOUR SAFETY, FOLLOW THESE INSTRUCTIONS TO SHUT DOWN YOUR HEATER

1. Set the thermostat to off or the lowest setting.
2. Turn off electric power to the heater.
3. Turn off the manual gas valve in the heater supply line.
4. Call your registered installer/contractor qualified in the installation and service of gas-fired heating equipment.

⚠WARNING

Fire Hazard

Keep all flammable objects, liquids and vapors the minimum required clearances to combustibles away from heater.

Some objects will catch fire or explode when placed close to heater.

Failure to follow these instructions can result in death, injury or property damage.

Maintain _____ clearance to the side and _____ clearance below the heater from vehicles and combustible materials.

Bananza
1100 Seven Mile Road NW
Comstock Park, MI 49321
Telephone: 616.728.8800
Toll Free: 800.255.3416
Fax: 616.726.8807

Installation Code and Annual Inspections:
All installation and service of BANANZA® equipment must be performed by a contractor qualified in the installation and service of equipment sold and supplied by Bananza and conform to all requirements set forth in the BANANZA® manuals and all applicable governmental authorities pertaining to the installation, service and operation of the equipment. To help facilitate optimum performance and safety, Bananza recommends that a qualified contractor conduct, at a minimum, annual inspections of your BANANZA® equipment and perform service where necessary, using only replacement parts sold and supplied by Bananza.

Further Information: Applications, engineering and detailed guidance on systems design, installation and equipment performance is available through BANANZA® representatives. Please contact us for any further information you may require, including the Installation, Operation and Service Manual.

This product is not for residential use.

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